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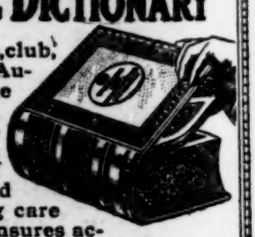

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THE JOURNAL OF
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THE EFFECT OF THE "ACQUAINTANCE FACTOR" UPON PERSONAL JUDGMENTS

F. B. KNIGHT

State University of Iowa

One person's opinion of another is a most useful instrument in the work of selecting employees or in making decisions concerning the promotion or dismissal of a worker. Until objective tests of performance, ability, character, temperament have been so developed and refined that our present tests are but historic curiosities in comparison, personal estimates in one form or another must be used.

During the last few years statistics, psychology, and common sense have all aided in improving the technique of arriving at a truer estimate of a person through the judgment of his acquaintances. The main lines of improvements have been:

1. Increasing the value of estimates by increasing the number of judges.

2. Determining the reliability of the estimate by proper statistical treatment of the judgments.

3. Directing the judgments through forcing the judges to make more analysed estimates by listing specific traits to be judged.

4. Clarifying the meaning of adjectives such as "honest," "hard working," etc., by many devices, the "man to man" scheme perhaps being the most fruitful.

5. Bringing to light several errors in rating schemes which must be reckoned with in a sophisticated interpretation of the ratings.

Two pitfalls in rating schemes have been previously pointed out. The importance of both is obvious. Thorndike in a study of ratings of engineers and Knight in a study of ratings of teachers have shown that when specific traits are rated the effect of general estimate seriously invalidates the specific ratings *as specific ratings*. The too high correlations between relatively unrelated traits show that a judgment of a

specific trait is the product of general estimate and the estimate of the specific trait. Knight and Franzen have reported data which show that self-estimates hide a rather constant tendency to over-rate oneself.

The subject of this paper is to report the effect of varying lengths of acquaintanceship upon personal ratings. "How long have you known the applicant?" is a question appearing on recommendation blanks used in the personnel departments of most concerns. Of what significance is the answer to the question: "How long have you known the applicant?" It is commonly assumed that length of acquaintance increases the accuracy and the reliability of the judgment. If the varying lengths of time of acquaintance are one minute, two hours, three weeks, there may be a close direct relationship between worth of estimate and length of acquaintance. When varying lengths of acquaintance is a matter of years we find that *knowing the applicant too long, apparently decreases the critical value of the judgments.*

The data used in this study are the analysed ratings of 1048 public school teachers of one school system made by the supervisors under whom the teachers were working. These data were not specially gathered for this report. The ratings are a regular part of the supervisor's work. Uses of them are genuine in the actual conduct of the school system. They are the responsible judgments of responsible supervisors and consequently possess a reality that certain types of purely experimental data do not.

The rating card used is reproduced here.

Name of Teacher (Surname First)

I. PHYSICAL EFFICIENCY	I.	II.
Health	....	....
Neatness	....	....
Energy	....	....
Endurance	....	....
Voice	....	....
II. SOCIAL EFFICIENCY		
Use of English	....	....
Self Control	....	....
Optimism	....	....
Discretion	....	....
Sense of Humor	....	....
III. DYNAMIC EFFICIENCY		
Initiative	....	....
Enthusiasm	....	....
Industry	....	....
Forcefulness	....	....
IV. CO-OPERATION		
Promptness	....	....
Adaptability	....	....
Sympathy	....	....
Loyalty	....	....
Response to Extra Curricular Demands	....	....

V. SKILL IN TEACHING	I.	II.
Organization of Subject Matter	....	....
Presentation of Subject Matter	....	....
Taking Care of Individual Pupil	....	....
Popularize Work without Cheapening It	....	....
VI. CLASSROOM MANAGEMENT		
Skill in Discipline	....	....
Neatness of Room	....	....
Care of Physical Property	....	....
Attention to Heat, Light, Ventilation	....	....
Accuracy and Promptness in Handling Reports	....	....
GENERAL RATING	....	....
Principal's Name	....	....
Date	....	....
School	....	....
How long has the above Teacher taught under your Supervision?	....	....

E—Excellent G—Good
A—Average F—Fair P—Poor

Note: Grade sub heads in column I and main heads in column II.

As we are concerned with the general problem of the effect of varying lengths of acquaintance we can treat the idiosyncrasies of individual supervisors as chance errors. The main facts are as follows:

The Influence of the Acquaintance Factor on Estimates of General Ability

From the rating card shown above we see that definite superiority is designated *E*, merit above the average *G*, average teaching ability *A*, less than average *F*, and decidedly inferior ability *P*. Table I reports the percentage of ratings given to teachers known to supervisors for varying lengths of time. The column in Table I headed "Number of Years," gives the length of time the supervisor has known the teachers.

Table I

Number of years	Number of teachers	*E*, per cent	*G*, per cent	*A*, per cent	*F*, per cent	*P*, per cent
½	93	8	55	25	10	2
1	230	22	56	18	4	
2	292	35	48	13	3	
3	140	40	45	13	2	
4	93	45	45	9	1	
5	60	47	43	5	5	
6	43	65	30	5		
7	50	46	42	10	2	
8	20	50	45	5		
9	6	83	16			
10	3	67	33			
11	4	50	50			
12	1	100				
13	7	85	14			
14	1	100				
16	1	100				
20	2	100				
24	1	100				
25	1	100				

Let us compress these data into five "acquaintance" groups. One group is composed of those rated who were known to the judge less than one year. In the subsequent charts this group is called the "1-year group" ($n = 93$).

The second group will be called the whole group. These are all the teachers irrespective of how long the judges were acquainted with each teacher, *i.e.*, the factor of acquaintance neglected. The average length of acquaintance is about 1.3 years ($n = 1048$).

The third group is composed of those rated who were known to the judge 7 years. This is called the 7-year group ($n = 50$).

The fourth group is composed of teachers known to the supervisor 8 years or more ($n = 47$).

The fifth group is the fictitious normal distribution. Here the marks given being

E = excellent
G = good
A = average
F = fair
P = poor

The group will receive approximately 10 per cent, E; 20 per cent, G; 40 per cent, A; 20 per cent, F; 10 per cent, P.

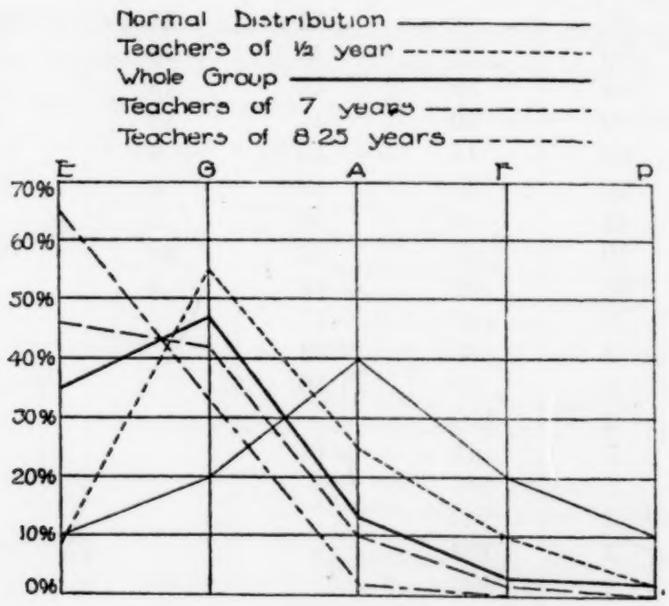

CHART I.

Chart I shows the distributions of the percentages of the marks given to the teachers of the 4 acquaintance groups together with a rough normal distribution for the trait "General Efficiency."

The progressive skewness of the distributions in direct relation to the length of acquaintance is evident. The 1-year group most closely

approximates a normal distribution. The teachers known longest are rated in almost grandiose terms.

Chart II shows the sigma locations of the ratings for the several groups upon a normal curve for the trait, general ability. As sigma distances are measures of "awayness" from the average, they can be used as measures of the *significance* of a rating. The symbols *E*, *G*, *A*, *F*, *P*, refer to the ratings. The symbol *n* represents normal distribution; 1, the first year group; *W*, the whole group; 7, the 7-year group; 8, those teachers known by their supervisors 8 years or more.

From this chart we see that for a teacher known to a supervisor for 1 year or less to receive an *E* rating (*E*1) means that she is "away"

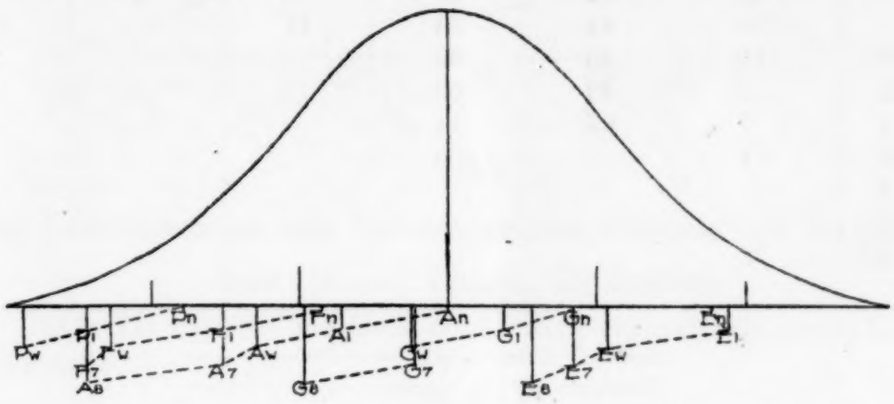

CHART II.

from the average about to the extent that would be normally expected (*En*); *E* ratings for teachers known 8 years or more is by no means as significant a rating. *G* rating for both the 8- and 7-year groups are actually below the average! We are not interested in the over-rating tendency alone. The sweep of the ratings away from normal expectancy in direct relation to length of acquaintance is certainly illustrated by Chart II.

The sigma locations of the ratings for the several acquaintance groups are consistent with or rather support the contention that increasing amounts of acquaintance increasingly vitiate the ratings. *GW* is the one "error." It is misplaced by 0.02 sigma.

THE EFFECT OF THE ACQUAINTANCE FACTOR ON RATINGS FOR PHYSICAL EFFICIENCY

Table II reports the facts for the Physical Efficiency Ratings. As in Table I "Number of Years" is to be read, number of years teachers have been known by the supervisor who rated.

TABLE II

Number of years	Number of teachers	*E*, per cent	*G*, per cent	*A*, per cent	*F*, per cent	*P*, per cent
½	88	23	53	14	7	2
1	232	24	55	14	6	
2	298	34	49	15	2	1
3	134	31	51	14	2	1
4	86	42	48	9	1	
5	59	32	50	17	2	
6	32	35	44	19		
7	50	54	36	6	4	
8	18	44	33	17	..	5
9-10	10	40	60			
11-12	5	40	60			
13-14	7	85	14			
15-16	1	..	100			
17-18						
19-20						
Over 20	2					

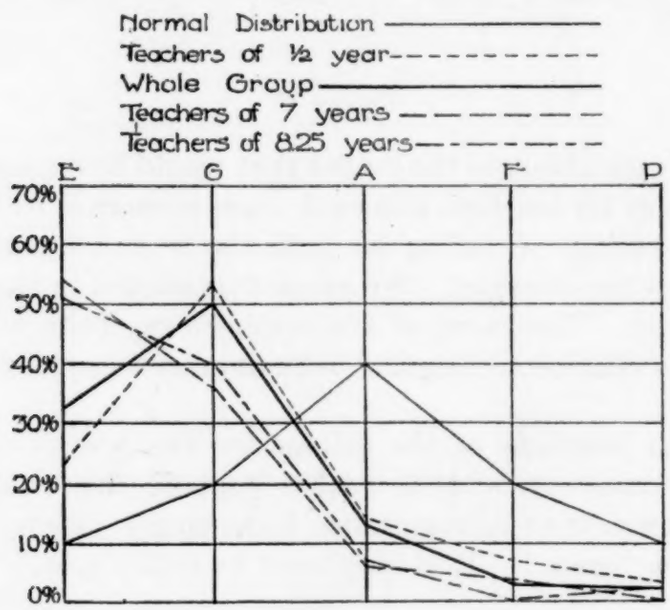

CHART III.

Chart III gives the distributions of the percentages of the several ratings for the trait Physical Efficiency awarded teachers of the different "acquaintance" groups together with a rough normal distribution. The influence of the "Acquaintance Factor" is apparent.

Chart IV pictures the sigma locations of the ratings for the several acquaintance groups. The decreasing significance of ratings as teachers are known for increasing periods of time by those who rate them is obvious.

The symbols are read in Chart II.

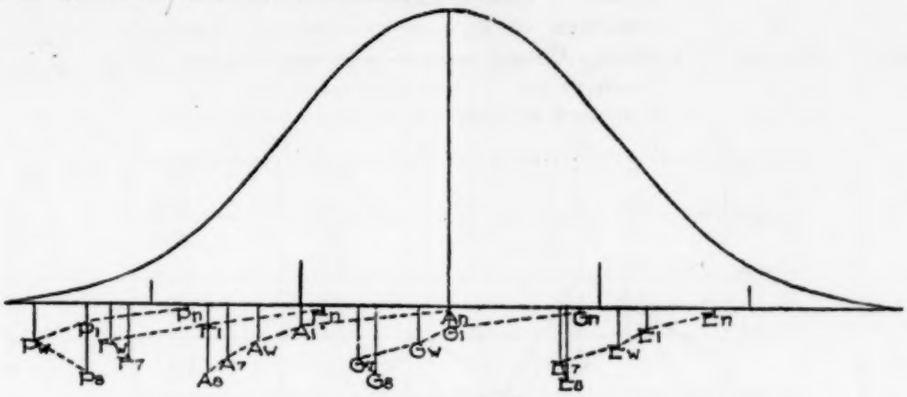

CHART IV.

THE INFLUENCE OF THE "ACQUAINTANCE FACTOR" ON RATINGS FOR THE TRAIT "SOCIAL EFFICIENCY"

Table III reports the facts concerning the ratings given for Social Efficiency.

TABLE III

Number of years	Number of teachers	*E*, per cent	*G*, per cent	*A*, per cent	*F*, per cent	*P*, per cent
½	87	18	62	18	1	
1	229	33	50	13	3	1
2	300	35	49	12	2	1
3	134	33	55	11	1	
4	87	38	48	13	1	
5	60	40	55	5		
6	30	50	33	13	3	
7	50	56	34	10		
8	19	31	42	26		
9-10	9	55	44			
11-12	5	40	60			
13-14	7	71	29			
15-16	1	100				
17-18						
19-20	1	100				
Over 20	1	..	100			

Chart V shows the distributions of the percentages of different ratings given to teachers known for varying lengths of time by the supervisor making the ratings for the trait "Social Efficiency."

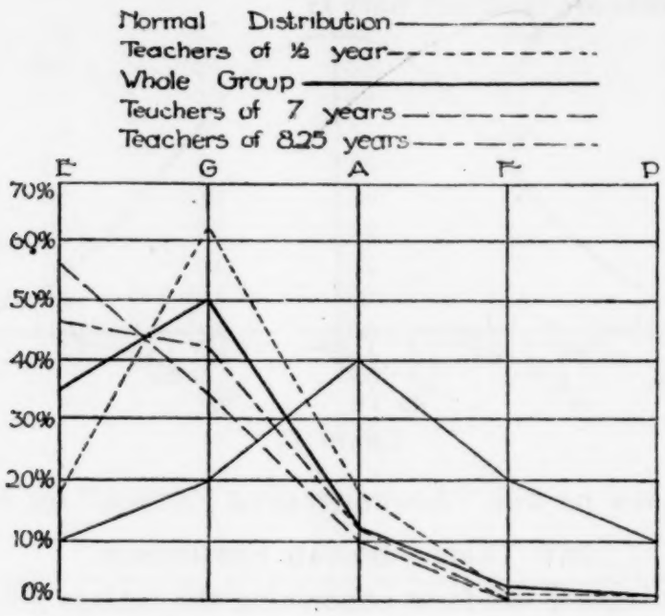

CHART V.

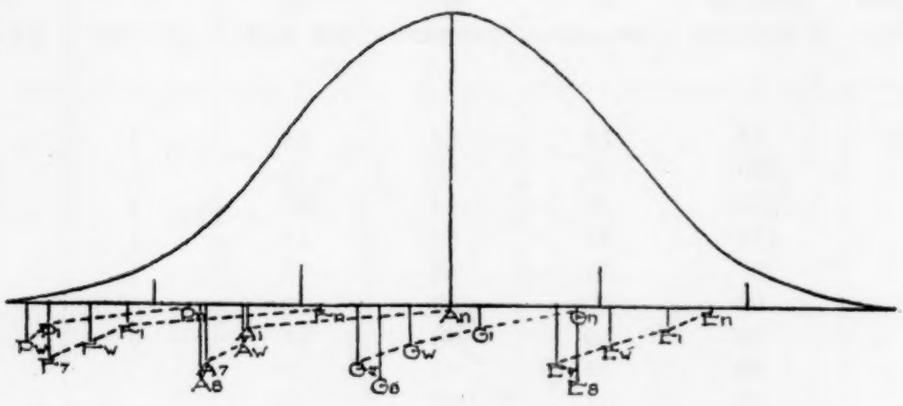

CHART VI.

Chart VI pictures the sigma locations for the trait, "Social Efficiency," of the several acquaintance groups. With ratings for social efficiency as with ratings for other traits the influence of lengthening acquaintance seems clear.

The Influence of the Acquaintance Factor upon Ratings for the Trait "Dynamic Efficiency"

Table IV reports the facts concerning the ratings for dynamic efficiency. This table is read as Table I.

Table IV

Number of years	Number of teachers	*E*, per cent	*G*, per cent	*A*, per cent	*F*, per cent	*P*, per cent
½	85	20	40	27	9	4
1	236	31	45	16	7	1
2	300	43	37	15	5	1
3	140	43	37	19	1	
4	89	53	30	15	1	1
5	61	49	38	11	2	
6	43	65	30	5		
7	50	50	36	10	2	2
8	20	50	30	15	5	
9-10	9	78	22			
11-12	5	40	40	20		
13-14	8	63	38			
15-16	1	..	100			
17-18						
19-20	2	100				
Over 20	1	100				

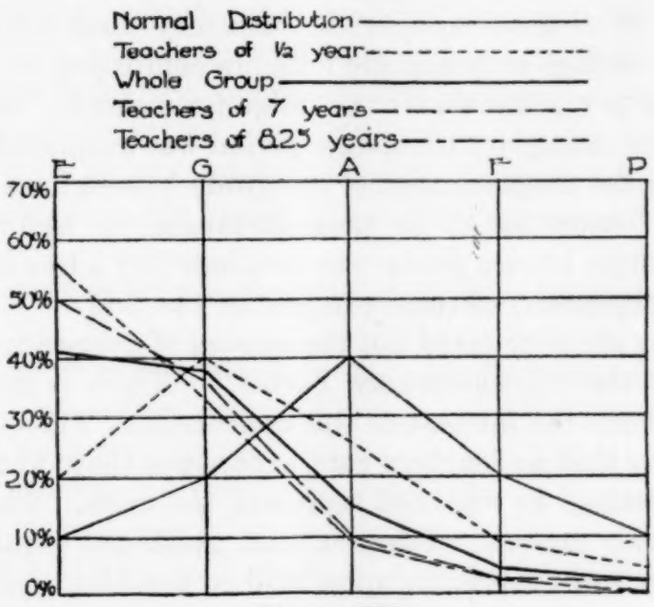

Chart VII.

Chart VII, read as Charts I, III, and V, shows the distributions of the percentages of different ratings given to teachers known to the supervisors for different lengths of time upon the trait "Dynamic Efficiency."

Chart VIII, read as Charts II, IV, and VI, pictures the sigma locations of the ratings given the different acquaintance groups for the trait "Dynamic Efficiency." It reveals further supporting evidence for the contention that increasing amounts of acquaintance is associated with decreasing amounts of critical judgment.

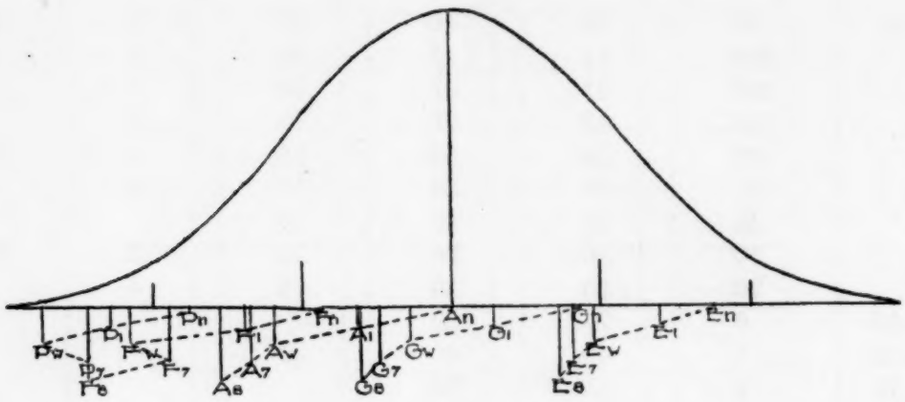

CHART VIII.

SUMMARY

The above data may be summarized as follows: The Acquaintance Factors had 80 chances to operate. Seventy-three times the significance of the ratings were obscured; *i.e.*, in comparing an acquaintance group with a group known by the judge for a shorter time, the sigma location of the ratings for the longer period was misplaced by a greater amount than the misplacement of the group known for a shorter time. There were 7 exceptions. In these instances the significance of the rating of a longer known group was misplaced by a less amount. The average misplacement of these exceptions was 0.17.

All groups are over-rated but the *amount* of over-rating seems to be a function of the "Acquaintance Factor." There is little reason for uneasiness about the fairness of this conclusion. The other apparent explanation is that as teachers gain experience they do gain in power and so the ratings as reported represent the facts. This is hard to believe for two reasons. First, several published studies upon the effect of length of experience upon skill in teaching, report but little

relationship between length of experience in amounts implied here and skill in teaching. Secondly, the explanation of the data as true because of length of experience would have to assume that length of acquaintance was a reliable measure of length of experience. It is not. Most of the teachers in this city had 2 years of experience in teaching before they taught *at all* in this city. Further, while no relatively young teacher could be known for many years by any supervisor, many teachers of long experience are in the 1-year group; others are not in the 7- and 8-year groups for frequent transfers of both teachers and supervisors in this city often causes different combinations of teaching units.

If one were tempted to explain the reasons for this over-rating the following three considerations may be found to be a part of the total explanation.

1. A supervisor could hardly admit, consciously or unconsciously, that "being under his direction brought no improvement." In a way the longer known teacher being rated higher is a compliment to the supervisor's influence. All of us are familiar with the mixed truth of such statements by a supervisor as this: "Teacher A was pretty poor when I first got her but I have developed her into a first class teacher."

2. A more subtle tendency operating to a slight extent in the Factor of Acquaintance may be unconscious indentification. Older teachers are more like the supervisors themselves, at least in age.

In placing teachers under a supervisor attempts are made to make assignments pleasing to both supervisor and teacher. There is quite possibly a tendency for certain principals to have one kind of a teacher instead of another as far as rough personality traits are concerned. An instance of a teacher's rating being affected by the bias of the supervisor is reported by Superintendent Reed of Akron, Ohio. He asked each principal to give the name of his best teacher and why that teacher was best.

Principal A gave as the reason for superiority in his choice, "He is a he-man."

Principal B gave as the reason for superiority in her choice, "She holds up high ideals before her pupils."

Principal A is an ex-athletic director. Principal B is an inveterate Sunday School worker. Identifying superiority in teachers with the judge's pet hobby seems to be operating here.

3. Negative adaption to persons as well as to environment is a possible explanation. We get used to people. Quirks of mannerisms

annoying at first soon lose their potency. Teachers who have become fixtures are accepted while new teachers are still on trial. Little mistakes, different ways of doing things, not "knowing the ropes," and other evidences of newness may effect supervisors' judgments of new teachers far more than they effect efficiency of classroom instruction, especially when most of the teachers have had 2 years experience before teaching at all in this city. The consistency of improvement in Physical Efficiency as teachers get older is a good case in point. No one would contend that the older a teacher is the more vitality and physical efficiency she has. Learning to get on with the supervisor may account for the higher ratings of older teachers as much or more than actual increase in classroom efficiency.

The data support the contention, that after allowing generously for increased efficiency due to experience, there remains a Factor of Acquaintance which tends to make the judge more lenient in proportion to the length of time he has known the person judged.

The Factor of Acquaintance and Analysis of Specific Traits

We will now report data calculated to show that the Factor of Acquaintance causes not only greater leniency but also less analysis. It might be thought that the longer a judge knew the persons judged, the keener would be his analysis of specific traits; *i.e.*, the well known halo of general estimate would be less and less. As a matter of fact critical analysis seems to get less and less and the influence of general estimate greater and greater as the length of the acquaintance increases.

The amount of critical analysis is shown by the intercorrelations existing between the traits. The size of the intercorrelations in this study is reduced below the usual intercorrelations because of the restricted range in the distributions. There are but five steps *E*, *G*, *A*, *F*, *P*. Where more steps in the arrays were obtained in similar studies far higher intercorrelations have existed with great uniformity. We base our argument here not on the size of the intercorrelations but on the *directions of their increase.* All are small because of restricted range but the intercorrelations get larger in the groups known to the judges for a longer time.

Presenting the intercorrelations between traits of different acquaintance groups *in order of length of acquaintance* we have:

Correlation between	Physical	Dynamic	General
Social	.448	.375	.465
	.443	.525	.619
	.359	.519	.665
	.610	.611	.595
Physical	....	.280	.463
	....	.525	.494
	....	.230	.400
	....	.605	.547
Dynamic	....	....	.620
	....	....	.760
	....	....	.875
	....	....	.799

In each set of form correlations above the top one is that of the 1-year group, the next for the whole group, the third for the 7-year group. The bottom correlation is for the 8-year group.

If the Factor of Acquaintance tended uniformally to increase the intercorrelations we could expect the intercorrelations of the 1-year group to be smaller than those in all other groups; intercorrelations of the "whole" group to be smaller than those in the 7- and 8-year groups; intercorrelation of the 7-year group to be smaller than those in the 8-year group.

With the four traits reported, there are 36 chances for the direction of change of intercorrelation to be studied. Thirty-one times the direction of change fits the Factor of Acquaintance theory. Three of the exceptions are correlations between Physical Efficiency and the other traits in comparing the whole with the 7-year group. The other two exceptions are in comparing the 7- with the 8-year group in the correlations between general ability and social and dynamic efficiency.

The average intercorrelation of the

1-year group is	+.442
Whole group is	+.561
7-year group is	+.508
8-year or over group is	+.628

The average *difference in size* between the intercorrelations of the 1-year group and the 8-year group is +0.186 which, in high positive correlation coefficients, is a significant difference. The average difference between the sum of the correlations of the 1-year group and the whole group (average acquaintance 1.3 years) and the sum of the 7-year and 8-year groups is +0.132.

Just how much intercorrelation there really is between useful traits is unknown beyond the probability of it being positive, and small. Independent of this consideration, the data support the statement that the influence of the Factor of Acquaintance is to increase the size of the intercorrelations which means that less analysis is taking place.

The Factor of Acquaintance, then, operates to make ratings more lenient, *i.e.*, increases the over-rating, and to make ratings less critical and less analytical, *i.e.*, increases the influence of the halo of general estimate. It is in the direction of truth to discount the ratings of judges when acquaintance has been long. In a way it is literally true to say of a judge's estimate: "His judgment is of doubtful validity *because* he has known his man *too long*."

A STUDY OF THE INFLUENCE OF SECTIONING STUDENTS UPON THEIR ACHIEVEMENT

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With the increased student enrollment of universities and colleges within the past few years it has commonly become necessary to separate the students registered for the more popular or required courses into two or more sections. Physical limitations in the form of restricted seating facilities may make this sectioning imperative; or the sectioning may be motivated by the belief that large classes are difficult to handle or that the individual student suffers in proportion to the size of the class group.

On the other hand, certain very strong objections are sometimes raised to this sectioning of the larger classes. There are those objections which have their root in the experimental work that has been done on the relative mental efficiency at varying hours of the day. It is argued that the students of one section may be given an advantage over the other section simply through the hour at which each group meets. This advantage, or disadvantage as the case may be, has a multitude of causes.

The fatigue of the instructor is to be considered in case the sections follow one another and are under the same instructor. This fatigue would give the advantage to the section meeting first. But should not even the most experienced teacher improve somewhat through practice? Perhaps the loss of the second section due to the instructor's fatigue may be offset by his improvement due to practice.

The argument, *pro* and *con*, in these general terms may be carried out to any length. The only justifiable method of really determining whether or not one section has an advantage over the other due to the fact that the one follows the other or precedes it, is to compare the records of scholastic achievement of a large number of classes that have been sectioned. Then there will be some basis in fact as it actually works out for the discussion.

I

The following portions of this communication will report the findings of a study of the grades received by the elementary students in

psychology in a large university throughout a period of 10 years. The records studied extend from the academic year of 1909–1910 until 1921–1922. During this interval the students enrolled in elementary psychology were divided into two sections. From 1909 until 1915 the sections met three times weekly. Section A met at 9 and Section B at 11. The regular class meetings were devoted either to lecture or to experimental work. From 1915 until the close of the period covered in this report the sections continued to meet at 9 and 11 respectively but only semi-weekly. These 2 hours were devoted to lectures and experimental work. From 1915 on, the third hour was spent in smaller groups at scattered periods in a conference with some staff member from the Department of Psychology. The records for 1918–1919 are omitted from this report due to the general demoralization and fragmentary records caused by the Student Army Training Corps. The 1919–1920 records are also not included since the quarter system was in use for that year only. All the 10-year records herewith reported are on the semester basis.

The marking system used in reporting grades is from *A* to *F*: *A* is given for the best work; *F* is failing; *C*, the average. The marks given for the first 6 years may be fairly compared since they were given almost entirely by the same instructor. The last 4 years of grades reported are not quite so homogenous, the markings for these later years being in the hands of those who handled the smaller or conference sections. For these years we must therefore trust to the safety afforded by numbers and assume that in the long run each conference section instructor had students equally distributed among the 9 and 11 o'clock sections.

If there is to be any difference found between the achievements of the two groups one would be led on *a priori* grounds to expect the most marked unequalness in the first interval of 6 years. During this interval the two large sections met three times weekly. During the later interval the large sections met only twice weekly while the smaller sections met at widely scattered periods for the conference. Accordingly, in presenting the findings they will be separated into the two intervals; the first of 6 years and the second of 4 years.

In Table I are given the percentage distribution of the various marks by years, semester, and section for the first interval. Section A, it will be recalled, met at 9 o'clock, Section B at 11 o'clock, three times weekly.

TABLE I.—DISTRIBUTION OF GRADES IN PER CENT RECEIVED BY THE TWO SECTIONS, 1909 TO 1915

Section A

	A[1]		*B*		*C*		*D*		*E*		*F*		Number of cases	
1909–10	6.3	8.3	30.0	27.2	40.0	40.0	14.5	13.9	4.5	10.6	4.5	0.0	110	95
1910–11	5.8	5.0	23.6	26.0	41.7	51.0	21.2	16.0	5.8	2.0	1.9	0.0	103	100
1911–12	6.4	3.4	18.0	25.9	46.2	49.9	14.1	20.1	14.1	4.5	1.2	0.0	78	89
1912–13	5.4	7.8	15.1	27.2	54.9	49.0	15.1	14.6	8.6	1.2	0.8	1.2	93	89
1913–14	3.4	6.4	16.4	17.6	45.6	51.4	22.4	21.0	9.5	2.7	2.6	0.9	116	109
1914–15	3.7	6.1	16.8	18.7	48.5	53.1	24.2	21.4	6.8	0.0	0.0	0.6	161	164
Interval, average	5.2	6.2	19.9	23.8	46.1	48.4	18.6	17.8	8.2	3.4	1.8	0.4		

Section B

	A[1]		*B*		*C*		*D*		*E*		*F*		Number of cases	
1909–10	1.9	3.8	27.1	29.1	60.1	50.5	8.7	15.5	1.1	0.9	0.9	0.0	103	103
1910–11	3.9	6.7	36.9	29.6	43.4	47.7	13.1	5.7	2.6	7.9	0.0	2.4	88	76
1911–12	3.5	0.9	25.3	28.6	40.1	43.9	21.8	22.0	8.1	4.4	1.2	0.0	87	91
1912–13	2.8	2.7	21.0	29.7	51.3	54.6	20.1	12.0	3.7	0.9	0.9	0.0	109	108
1913–14	0.0	3.8	18.5	10.1	53.3	45.9	18.5	27.1	8.1	10.1	1.5	2.8	135	129
1914–15	4.1	2.9	18.8	23.9	50.8	50.0	16.6	20.1	9.0	1.1	0.7	0.7	144	138
Interval, average.	2.7	3.4	24.6	25.2	49.8	48.8	16.5	17.1	5.4	4.2	0.9	0.9		

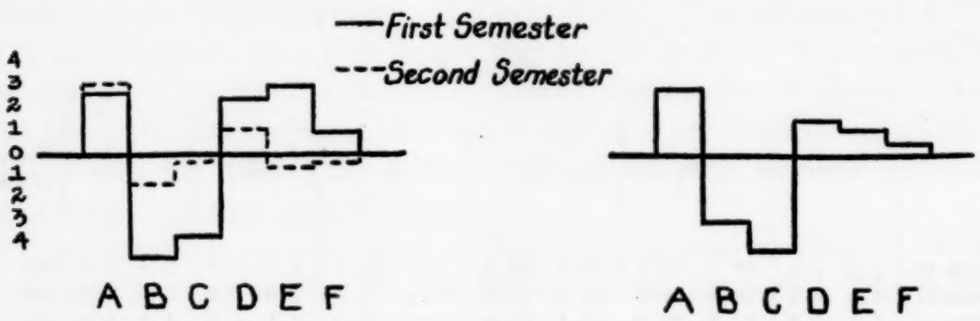
[1] The figures to the right in each division are for the second semester.

Chart I compares the accomplishments of the two sections by showing the difference in the per cent of the marks given to each group. The plots above the base line represent an excess over the 11 o'clock section of the grade indicated to the amount indicated by the 9 o'clock section. The plots below the base line represent an excess of the grades to the amounts indicated but for the 11 o'clock section. A study of the figure to the left, in which, the semester differences are indicated, shows that there is a small, but perhaps significant, difference between the two sections. It is apparent that the earlier sections have a larger proportion of better and poorer students. Perhaps it should be stated best students, since the A section exceeds the B section in students making the highest mark but not in the students

making the next highest mark, which is still considered to be distinctly above average in the institution from which the data were secured.

In the first semester's work this difference between the two sections is more marked than in the second semester. The second semester has a leavening effect, as it were, which tends to smooth out the section differences, especially in the lower marks. When we average the grade distributions for both semesters by sections a difference such as that graphed to the right of Chart I is found. The section which met at 9 o'clock is still found to make more of the highest and lower grades than the other section which met 2 hours later.

CHART I

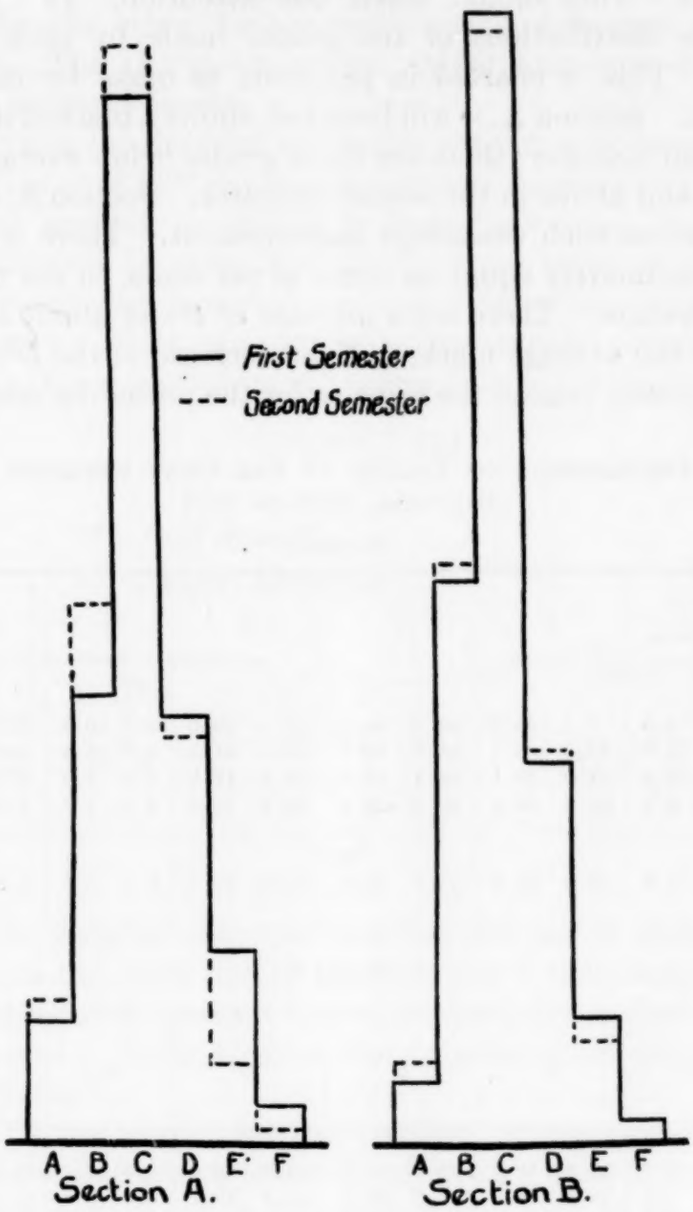


Section A apparently either selects or makes superiors and inferiors while Section B encourages averageness. It is difficult, if not impossible, to account for this difference as being due to the selection of the students for the two sections. The schedule of classes in the college is arranged around the schedule for elementary psychology in order to prevent conflicts in the class programs of the underclassmen. The students are placed in one section or the other depending largely upon the order in which they present themselves before the sectioning desks on registration days. The peculiar difference between the marks received by the two sections can also hardly be accounted for by assuming that there is an unequal sex distribution between the sections. Records for one year, which are typical, show 50 men and 82 women in Section A and 53 men and 81 women in Section B.

Just how to account for this unusual difference in the accomplishments of the two sections is difficult. It is apparent that there is some difference, and this difference is of a sort to be significant, although it is not enormous. It is generally agreed among the students that they are not at their best at the 11 o'clock hour; this is based

upon the verbal reports of the students and not upon any experimental work. The students further state that they have to exert themselves unusually to get as much out of the 11 o'clock lecture as they would

CHART II



have obtained spontaneously 2 hours earlier. Perhaps this added effort accounts for the minimum of failures and low grades in Section B. But if this holds equally for all students there should be a general skew of the curve for Section *B* toward the higher end. As a matter

of fact there is a skewing in the grade of B but a marked decrease in the highest mark of *A*.

Some change in the accomplishments of the two sections in the second semester lessened the difference between the two groups of students. This should merit our attention. In Chart II are plotted the distributions of the grades made by each section, by semesters. This is charted in per cents to make for ease of visual comparison. Section A, it will be noted, shows a marked improvement in the second semester; there are fewer grades below average and more at average and above in the second semester. Section B, on the other hand, shows no such consistent improvement. There is an increase in *A*'s approximately equal, in terms of per cents, to the same gain by the other Section. There is an increase of *B*'s of about 1 per cent, a decrease in the average mark, a slight decrease in the *D*'s, fewer *E*'s, while the failures remain the same as for the preceding semester.

TABLE II.—DISTRIBUTION OF GRADES IN PER CENT RECEIVED BY THE TWO SECTIONS, 1915 TO 1921

Section A

	A[1]		*B*		*C*		*D*		*E*		*F*		Number of cases	
1915–16	7.4	4.9	7.4	23.9	46.4	40.0	27.8	20.0	7.2	10.0	3.8	1.2	153	150
1916–17	1.9	2.0	14.6	23.1	48.2	42.2	25.3	21.8	8.0	9.8	2.0	1.0	210	202
1917–18	3.3	4.5	21.5	20.1	48.1	55.9	22.2	17.9	4.5	1.5	0.4	0.0	135	134
1920–21	5.5	6.8	24.3	20.9	40.2	44.4	20.9	18.5	4.6	4.7	4.3	4.5	258	246
Interval, average	4.5	4.5	16.9	22.0	45.7	45.6	24.0	19.5	6.1	6.5	2.6	1.7		

Section B

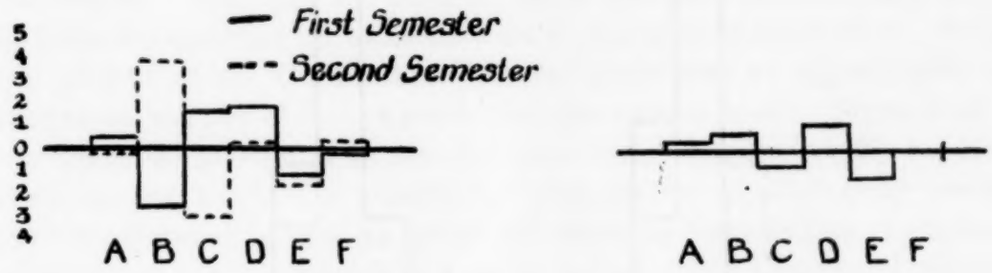
	A[1]		*B*		*C*		*D*		*E*		*F*		Number of cases	
1915–16	4.1	5.2	14.8	18.6	48.2	41.7	20.0	18.6	8.5	12.7	2.3	3.0	135	134
1916–17	4.8	4.6	24.1	18.3	37.8	49.5	24.9	19.1	8.9	8.5	0.7	0.0	145	131
1917–18	3.3	5.3	21.5	17.7	55.3	53.1	16.9	20.3	1.5	4.7	1.5	1.7	130	113
1920–21	4.4	3.4	17.2	18.7	35.6	50.0	26.5	19.2	10.0	5.5	6.3	1.9	238	208
Interval, average	4.1	4.6	19.4	18.3	44.2	48.6	22.1	19.3	7.2	7.9	2.7	1.6		

[1] The figures to the right in each division are for the second semester.

It is this marked improvement in the work done by the 9 o'clock section during the second semester that brings about a lessening of the difference between the accomplishments of the two sections. This improvement on the part of the students who did poor work in the first semester tends to bring the accomplishment of Section A nearer to averageness. The 11 o'clock section exhibits no such change in the work of the second semester.

Summarizing the data for the first 6 years it may be said that the achievement of over 1300 students in sections of elementary psychology under actual working conditions indicate that those enrolled in a 9 o'clock section will be more likely to do either better or poorer work than those enrolled in a section meeting 2 hours later, who will tend to averageness. It is also evident that greater improvement is evidenced by those enrolled for the earlier hour as the course progresses.

CHART III



II

It will be recalled that the data for the last 4 years were kept separate from the other due to the fact that a complicating factor in the form of smaller sections known as Conference Sections entered upon the scene. Table II gives the data for these years in a form similar to Table I.

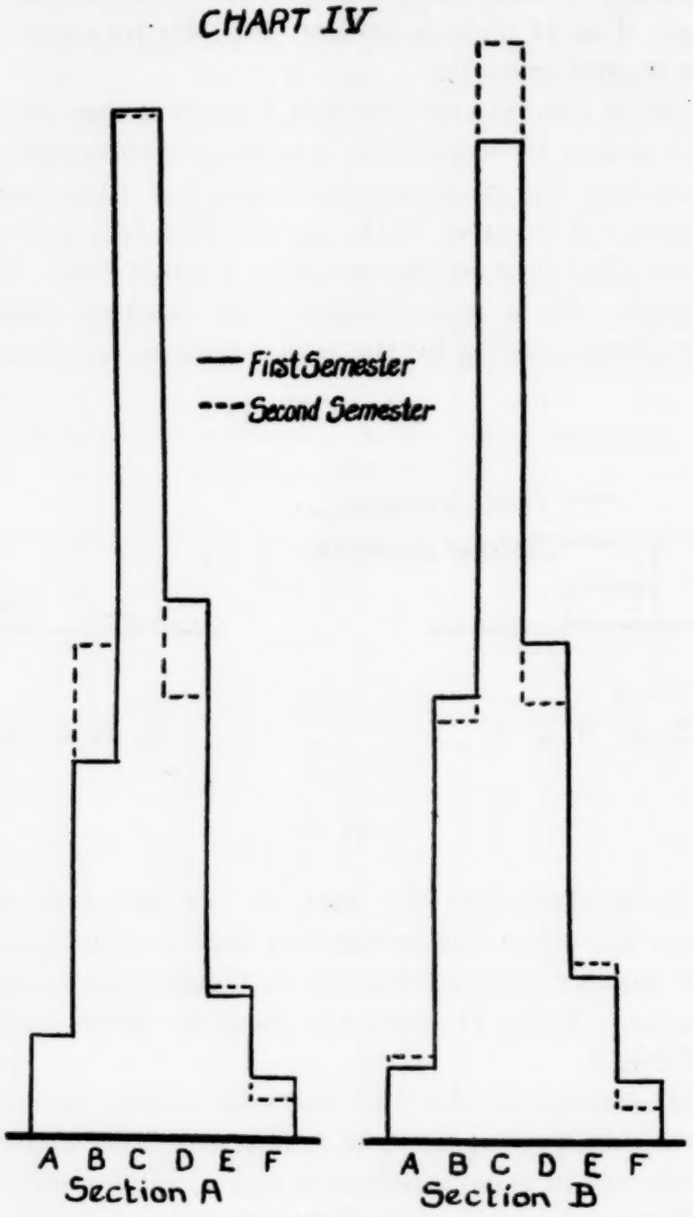
Chart III compares the two sections as was done in Chart I. But notice the difference; there is apparently little rhyme or reason in their differences in accomplishment now. First of all, it is evident that the differences are of a smaller proportion; and secondly, they do not persist in a given direction as for the 6 previous years.

Comparing the calculated average grades for the year for this 4-year interval with those of the 6-year interval (plot to the right in Charts I and III) the general tendency of both intervals is seen to be

the same. For the later interval, however, the variations between the sections are less marked, but still Section A is leading, though barely so, in superiors.

Comparing the marks received in the first semester with those of

CHART IV



the second semester by sections (see Chart IV) it is apparent that Section A again shows a decided improvement in the second semester. Section B also begins to show signs of improving in the marks received in the second semester. It will be recalled that for the first interval

of 6 years Section B showed but little, if any definite, improvement in the second semester over the first.

Summarizing the data for the second interval of 4 years it may be said that with the elimination of one of the hours for the meeting of the general sections and the substitution therefore of a smaller Conference Section there is a lessening of the differences between the marks received by the two general sections, although there still persists a small factor of advantage favoring the 9 o'clock section.

III

It remains for some explanation to be attempted to account for the variations in the achievements between the two sections. Reverting to the general discussion, one would not expect a great difference between the sections. After all the time spent in the lecture room is only about half that spent by the ideal student in following through the course. Readings are perused under the same conditions as would be followed whether the student were in one section or another. Before the advent of the Conference Sections there was no opportunity for recitation worthy of the name during the lecture hour. Since most of the material presented in the lectures is not foreign to the required readings one would not expect the mere matter of what hour the lecture is attended to make a great difference in determining the accomplishments of the students in a given course. But the *factual* material which has been examined seems to indicate that the lecture hour does have some effect. Of course, the difference between the accomplishment of the sections is not great enough to make or break either, but still it is great enough to be significant—theoretically, at least, if not practically.

Gates found[1] that about 4 times as many students preferred the 9 o'clock hour as favored the 11 o'clock hour. This is the general conviction of college students, in the writer's belief. But still Gates, and others, have found that for such activities as auditory memory, rapidity of learning as measured by a substitution test, and recognition, there is a factor of advantage—regardless of what that factor may be—that favors the 11 o'clock worker rather than the 9 o'clock worker. The average of all Gates' Tests slightly favors the 11 o'clock hour.

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[1] Gates, Arthur I.: Diurnal Variations in Memory and Association. *University of California Publications in Psychology*, Vol. I, No. 5, pp. 323–344.

But still, under actual classroom conditions for a period of years, students at 9 are making better marks than those at 11. Of course, instructors' marks are not the acme of accuracy but when tendencies so definite as those found are present they are not to be scoffed away.

Neither is one's feelings nor notion of mental efficiency always the most precise index of his real working condition. But it is these feelings of fatigue or readiness that determine largely the responses of the students to certain situations. The verbal reports of the students in the sections for 1921–22 are overwhelmingly to the effect that they have to force an alertness and attitude of attention at the 11 o'clock hour. The learning attitude of Section B is much more favorable to learning that that of Group A. The correlation (r) between marks and the composite score on the Thorndike Intelligence Test is 0.21 for the 9 o'clock section and 0.32 for the 11 o'clock section, for the first semester of the academic year 1921–22. The Thorndike Test was taken at the same hour under the same conditions by both sections. The correlation is higher for the 11 o'clock section. Perhaps because students go about Intelligence Tests with a forced attitude similar to that which the students of Section B say they have to assume before the noon hour.

The deficiency of Section B in high and low marks may be accounted for in part by comparing this with Gates' findings. Gates' work with college students showed that their variability was greater at 9 o'clock than at 11 o'clock, except for logical memory. This may explain why the 9 o'clock section had a wider distribution of marks than the 11 o'clock section.

IV

A study of the scholastic accomplishments of 2,700 students in a course in elementary psychology shows that dividing these students into two sections which met at 9 and 11 o'clock respectively brings about the following variations:

1. The 9 o'clock section makes either better and poorer grades than the 11 o'clock section; while the 11 o'clock section tends toward averageness in accomplishment;

2. The differences between the accomplishments of the two sections is greatest when the sections meet at the hours designated three times a week than when they meet twice a week, with a conference period substituted for a third lecture;

3. The variations between the sections in marks earned become

less as the course is continued, more so for the three weekly lectures than for the two;

4. Students in the 9 o'clock section show greater improvement as the course progresses than do the other students;

5. Intelligence, as tested by a standard test, correlated higher with the accomplishments of the 11 o'clock group than for the 9 o'clock group.

EFFICIENCY OF INSTRUCTION IN UNSELECTED SECTIONS IN ELEMENTARY PSYCHOLOGY COMPARED WITH THAT IN SECTIONS SELECTED ON BASIS OF INTELLIGENCE TESTS

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The practical use of intelligence tests in universities has hitherto been limited for the most part to the solving of problems concerned with students considered as individuals. The results of tests have been employed as a supplement to or substitute for entrance requirements, and as a means of dealing with such problems as those presented by students who are delinquent, on probation, or desirous of carrying extra hours. The following study deals with the application of the results of intelligence tests in the division of university students into groups for purposes of instruction. The main problem of the study is to determine whether a group of students fairly homogeneous in intelligence can be taught more efficiently than a heterogeneous group.

During the year 1920–1921 each of the three writers was scheduled for a section in elementary psychology at the same hour. Nearly all of their students either took the university intelligence test (a somewhat modified army "Alpha") early in October or had taken Alpha the previous year. The two tests were of slightly different difficulty, but were subsequently equated by converting raw scores into percentile scores, using as a basis the scores made by over 2000 freshmen in each case. On the basis of these intelligence scores, the students in the 3 sections were redistributed, as soon as the returns from the intelligence tests were available, into sections more nearly homogeneous in intelligence. A similar distribution was made at the opening of the second semester. The personnel of the same section during successive semesters remained fairly constant although there were certain drops, withdrawals, additions, transfers, and slight changes in distribution of the sections as indicated below. Since each semester's experiment was evaluated as a unit, constancy of personnel was not requisite. In addition to these sections scheduled at the same hour, each writer had one or two sections of students taking the same course at a different hour of the day. Thus for each selected section there was available one or more control sections taught by the same instructor.

Table I shows how the experimental sections were distributed on the basis of intelligence. The table gives for each semester the number of students in each section, the mean percentile intelligence, the standard deviation, and the range of intelligence. For example, the first line indicates that the selected high intelligence group during the first semester comprised 47 students whose mean intelligence percentile was 83 with a standard deviation of 9 and a range from 65 to 100. For the second semester, the corresponding figures were 49, 84, etc.

TABLE I.—INTELLIGENCE PERCENTILES OF SELECTED AND CONTROL GROUPS

Groups	First semester				Second semester			
	N	Mean	SD	Range	N	Mean	SD	Range
(*H*) Selected-high intelligence	47	83	9	65-100	49	84	9	67-100
(*A*) Control for high group	44	51	27	3-100	64	52	26	3-100
(*M*) Selected-medium intelligence	60	54	12	36- 68	41	54	11	37- 74
(*B*) Control for medium group	63	48	23	6- 83	47	48	22	6- 83
(*C*) Control for medium group	..	..	..	.....	55	46	27	4- 97
(*L*) Selected-low intelligence	46	21	11	2- 36	35	22	11	2- 36[1]
(*D*) Control for low group	47	49	29	1-100				
(*E*) Control for low group	..	..	..	.....	41	61	28	4- 99
(*F*) Control for low group	26	55	29	3- 98	20	61	29	3-100

[1] One apparently bright student was retested and proved to be 57 percentile rather than 36.

The next row gives similar data for the control section taught by the same instructor. Sections for first and second semester listed in the same row had considerable continuity of personnel. It is obvious that all the sections involved in the experiment were either distinctly homogeneous in intelligence or else distinctly heterogeneous, the standard deviation of the selected sections being as a rule only slightly more than one-third that of the control groups. The difference in the average intelligence of the selected sections was also very marked, the average percentile ratings during the first semester for the 3 groups being 83, 54, and 21, respectively; and during the second, 84, 54, and 22. One qualification should be made regarding the personnel of the selected medium intelligence group *M*, especially of the first semester. Since the intelligence records of a number of students were not available at the time of the original distribution, all such students were placed in the medium intelligence section in an effort to keep at least the extreme sections homogeneous. When these students subsequently took the intelligence test, it developed that 17 of them properly belonged in one or the other of the extreme sections

The data in regard to these students are omitted in the tabulated results. The second semester's distribution largely rectified this condition, only 7 students who belonged in the extreme sections remaining in the medium section.

The data include only students who completed the work of the course and who took the intelligence test.

For all the sections involved the content of the course was similar, for they used the same textbook, and covered approximately the same ground. The methods of instruction likewise were fairly similar, the work of the course consisting of textbook assignments, lectures, and oral and written quizzes. Moreover, the similarity in content and method was naturally much greater in the sections taught by the same instructor. Direct comparison between these sections is thus of greater significance than comparisons between other sections, and is the aspect of the study most emphasized.

Comparison between the selected sections is also possible, however, a common examination having been given to all at the close of the first semester as a part of the regular final examination in the course. It was arranged by the three instructors in consultation, and comprised 35 statements, some true and some false. The students marked them accordingly, and were scored number right minus number wrong.

During the first semester the rate of progress maintained in all sections was practically normal. During the second semester, however, the selected high intelligence group and the selected medium intelligence group and its two controls were "pushed." The high intelligence group was given longer assignments than its control and covered the course as outlined in 27 hours instead of 37, the remainder of the time being devoted to discussion of various aspects of applied psychology. The medium intelligence group covered the ground in 30 hours instead of 37. The low intelligence section maintained the normal rate of progress.

The theory underlying the principal aspect of the investigation is as follows: If the instruction given to a group of students is such that each one is stimulated to do his best, the correlation between intelligence and the academic marks obtained in a given course will be high; conversely, if intelligence correlates highly with marks, it is probable that the instruction was efficient in stimulating each student to use this maximum intellectual ability. If this criterion is valid, it is possible to compare efficiency of instruction in a selected homogeneous

psychology section with that in an unselected control section taught by the same instructor. This is the principle upon which the results of the experiment have been evaluated.

Table II presents all the results from the standpoint above indicated. Each coefficient in the table represents the correlation between

TABLE II

Groups	First semester		Second semester	
	r	PE	*r*	PE
(*H*) Selected-high intelligence	.32 (.11)	.09	.73 (.34)	.05
(*A*) Control for high group	46	.08	.45	.07
(*M*) Selected-medium intelligence	.15 (.08)	.09	.75 (.25)	.05
(*B*) Control for medium group	.38	.07	.15	.09
(*C*) Control for medium group	.....	...	.45	.07
(*L*) Selected-low intelligence	.67 (.32)	.06	.22 (.09)	.11
(*D*) Control for low group	.53	.07		
(*E*) Control for low group	.....	...	.07	.10
(*F*) Control for low group	.64	.08	.58	.10

intelligence and final mark for the semester's work in elementary psychology for the group and semester indicated. All coefficients were computed by the products-moments formula, using intelligence percentiles and quantitative statements of psychology grades. The coefficients in brackets for the selected groups are the regular Pearson coefficients, while those directly to their left are augmented for restriction in range of intelligence due to selection—the homogeneity of these selected groups lowering the correlations secured.[1]

[1] It is possible to determine the correlation that would be expected if the intelligence had covered a wider range, knowing the standard deviation of the distributions of the smaller and the wider ranges, by the use of a formula for which the writers are indebted to Professor T. L. Kelley. It is as follows:

$$R^2 = \frac{r^2 \frac{\Sigma_x^2}{\sigma_x^2}}{1 - \left(1 - \frac{\Sigma_x^2}{\sigma_x^2}\right) r^2}$$

where r is the correlation between the two variables when x has the smaller range with dispersion σ_x; and R, the correlation when x has the wider range with dispersion Σ_x.

By the application of this formula the coefficients over the narrow range have been augmented to those which would be expected if the range had been the same as that of the corresponding control section or sections.

The crucial comparisons in the table are those between a selected section and its corresponding control or controls. With respect to the section selected for high intelligence and its control, it is obvious that in the first semester there was no greater efficiency of instruction in the selected group than in the unselected group taught by the same instructor. In fact, the correlations of 0.32 and 0.46 point somewhat in the other direction. The results for the second semester were quite diffierent, for the correlation in the selected group jumped to 0.73, while that for the control remained about the same as before. The explanation is not far to seek. During the first semester the two groups were kept at the same pace. The daily assignments were practically identical. It would appear that this pace was not sufficiently rapid for the selected group. During the second semester the control group continued approximately as during the first, while the high section was "pushed." Apparently this procedure was more stimulating. The obvious conclusion is that from the pedagogical standpoint nothing is gained by grouping students of superior intelligence for instruction under the conditions of this experiment unless they are forced to cover the material of the course at a more rapid pace than the average. Not only are they obviously able in the latter case to cover the ground more rapidly, but the individual student comes nearer working at his maximum intellectual efficiency.

A similar tendency is found in the returns for the group selected for medium intelligence and its controls. The results for the first semester should perhaps be discounted slightly, owing to the presence, as above mentioned, of a number of students in the selected group who did not belong there. But at any rate it is obvious that there is no evidence of more effective instruction in the selected group during the first semester. The groups during this semester it will be remembered proceeded at the usual rate in their study. During the second semester, however, when *both* the selected and the control groups were "pushed," the correlation between intelligence and final mark for the former jumped to 0.75, while those for the two control groups were 0.15 and 0.45. It would seem, then, that from the standpoint of effective teaching as measured by the criterion laid down above, nothing is gained by grouping together students of medium intelligence if the instruction proceeds in the usual manner. If, however, the students are forced to work harder than the average, the individual students come nearer working at their maximum intel-

lectual efficiency. Harder work, however, does not have this effect with a group of heterogeneous intelligence.

When the results in the case of the low intelligence group and its controls are considered, it is found that they are in striking contrast to those reported for the high and medium intelligence sections and their controls. Thus the first semester correlations are uniformly high whether the experimental group or its two controls are considered. On the other hand, two of the second semester correlations are relatively low while one is still relatively high. Further, examination of the correlations obtained for the low intelligence group in comparison with the correlations for its two controls, shows a similar contrast with the results for the high and medium intelligence sections and their controls. During the first semester, the low intelligence section showed a slightly higher correlation than either of its controls, the difference being the more marked in the case of Section D, which is more nearly comparable to it in size and constituency than Section F. During the second semester, although there is a similar difference in favor of the low intelligence group, when compared with Section E, which participated in the experiment only during the second semester, there is a very great disadvantage when compared with Section F.

The explanation of these results is somewhat in doubt; but probably a number of circumstances contributed. In the first place, possibly all groups taught by the instructor of the low intelligence section, particularly the low intelligence section itself, were forced to work more nearly up to maximum intellectual capacity during the first semester than during the second. There was no effort on the part of the instructor to this end except in the case of the low section, which necessarily had to work unusually hard because of the loss of time incurred by the readjustment following the regrouping on the basis of intelligence, which took place a considerable time after the opening of the first semester. To the extent to which the sections were in reality "pushed" the first semester, an explanation is afforded of the relatively high correlations for this semester. There is, however, no striking difference between the correlations for the selected section and those for the controls as a result. In the second place during the second semester the subject matter was more abstract and the lecture method was employed to a greater extent due to inadequacy of the text book. Both these facts might have resulted in an emphasis on verbal memorization which might conceivably have a lower correlation with intelligence than did general grasp of psychological subject

matter during the first semester. In the third place, section F had a conscientious and hard working personnel, a number of the class being mature school teachers, so that higher correlation would be expected.

The results with the low intelligence section and its controls indicate that under the conditions of the experiment nothing is gained from the standpoint of effective instruction by grouping together students of low intelligence. It is to be remembered, however, that no effort was made to "push" the low intelligence sections or their controls as was the case with the medium and high groups so that the results for this section neither corroborate nor disprove the findings with reference to the covering of the content of the course at a more rapid pace.

The comparisons above described were all between a selected section and its control (or controls) taught by the same instructor. A direct comparison of the three selected sections was possible from but one standpoint—the common portion of the final examination at the end of the first semester. The mean score (number of items right minus number wrong) for the high section was 20.1; for the medium section 17.1 and for the low section 15.1. The difference between the means for high and medium is 3.4 times the probable error of difference; that between the high and low is 4.9 times the probable error while that between the medium and low is 2.1 times. While the number of items of score in the common examination is small it is interesting to note the correspondence of these three averages with the intelligence of the groups. The difference between the extreme groups is certainly significant.

Summary

Students in three sections in Elementary Psychology meeting at the same hour were redistributed on the basis of tested intelligence. Each of the three instructors of these sections taught an additional section or two as control. The correlation between final course mark and intelligence in a given section was taken as a criterion of the effectiveness of instruction in that section. The crucial point of the study was such correlation in a selected section fairly homogeneous in intelligence compared with that in an unselected heterogeneous section taught by the same instructor.

In the case of the high section there was nothing gained by the selection unless this section was forced to cover the material of the course

at a more rapid rate than the average. If the pace was thus increased the individual students worked more nearly at their maximum intellectual level. The same result was found with the homogeneous section of medium intelligence. With the low section there was likewise no apparent advantage in the selection when the rate of progress was unchanged, but results bearing upon the other point were not available as the low sections were not "pushed."

The principal fact brought out by the study is that division of elementary psychology students into sections fairly homogeneous in intelligence is not of itself necessarily an advantage from the standpoint of efficiency in instruction. In the case of at least high and average intelligence sections the advantage of such division may be secured by covering the content of the course at a more rapid pace.

AN ATTEMPT TO DETERMINE ANOTHER ETIOLOGICAL FACTOR OF STUTTERING THROUGH OBJECTIVE MEASUREMENT

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The ability to communicate with one's fellows by speech is a learned reaction, just as the ability to communicate by writing words is a learned reaction. Man is not born knowing how to speak, read, or write; all of these things must be learned. However, men are born with varying capacities for these achievements; some may learn to read and write more readily than others, but the point is that these reactions to a social environment are an accumulation from the racial heritage and must be learned in accordance with the original nature man inherits.

In an examination of stutterers the procedure must be the same as in any other investigation of learned reactions. The laws of learning are operative in learning to speak in just the same way as they are in learning to read, write, or typewrite. Individuals do not learn in some inexplicable manner, the learning process follows certain fixed natural laws just as a falling body is drawn toward the center of the earth by the law of gravitation. If you would know how an individual learns to speak, then you must examine the natural laws which govern this process. These, as before suggested, are the laws of learning. According to Thorndike (*Educational Psychology*, Briefer Course, pp. 70–73) there are three primary laws of learning: They are the laws of instinct, exercise, and effect.

The law of instinct can be readily understood from the following quotations from Thorndike (*Educational Psychology*, Vol. 1, p. 135): "A little child apart from training, makes all sorts of movements of the vocal cords and mouth-parts resulting in cooings, babblings, yellings, squealings and squawkings of great variety.

"I repeat that vocalization means, roughly, the responding by many different sounds in many different sequences to many different external situations, and that from it develop, under training, speech, song, and other vocal arts." (*Ibid.*, p. 138.)

[1] This investigation is the first to be reported of a series which the writers have undertaken; therefore the conclusions reached are to be held tentatively until the research has been carried further.

From the above quotations it is plain that the law of instinct means in connection with acquiring speech, that an individual inherits a tendency to respond at an early age to different situations by "cooings, babblings, yellings, squealings and squawkings." These noises are man's potential speech. A child possessing a tendency to make such noises must be taught to change and modify them into articulate speech. Thorndike generally calls the law of instinct the law of readiness. The term is suggestive, for man's instincts are the moving, driving, dynamic forces which keep him "ready" to respond to the varying situations of his environment.

The law of exercise is of this nature: When an individual is confronted with a situation and makes a response to it, a connection or bond is formed between that particular situation and response with the result that if this same situation is again presented to the individual he will react probably with the same response. The more often an individual exercises a connection or bond between a given situation and response, the stronger will such a connection become. The converse of the law of exercise is also true—the more seldom an individual exercises a connection between a given situation and response, the weaker will such a connection become.

The following is a concrete example of the law of exercise in the case of an individual learning to speak: A cat walked across the floor of a room in which a young child was seated. Upon seeing it he stretched out his hands and made a squealing noise. "Cat," said his mother, "cat," repeated the child. In this instance, the moving animal, the mother's designation "cat" was the situation, and the child's reply "cat" was the response. In other words the child formed a connection or a bond between a situation and a response; he modified his instinctive squeal into the articular word "cat." In a manner something like this the child continues to bind together situation and response in building up a vocabulary. According to the law of exercise, the more often a bond is exercised the stronger it becomes, and conversely, the less often it is exercised the weaker it becomes.

The third law of learning, the law of effect, is explained this way by Thorndike: "To the situation a modifiable connection being made by him between an S (situation) and an R (response) and being accompanied or followed by a satisfying state of affairs, man responds, other things being equal, by an increase in the strength of that connection. To a connection similar, save that an annoying state of affairs goes with or follows it, man responds, other things being equal,

by a decrease in the strength of the connection." ("Educational Psychology, Briefer Course," p. 71.)

To illustrate the law of effect concretely suppose the mother, in the situation above described, smiled approvingly and patted the child when he responded "cat," the response would then have become satisfying to him, and other things being equal, he would tend in the future to make the same response to the same situation. Suppose, however, the converse were true—instead of smiling and patting the child at his response, the mother scowled, became angry, and perhaps shook the child, his response would then have been unsatisfying, and other things being equal, he would have tended in the future not to make this response to this situation.

Thorndike concludes his discussion of the laws of learning with this concise statement: "These tendencies for connections to grow strong by exercise and satisfying consequences, and to grow weak by disuse and annoying consequences, should, if importance were the measure of the space to be allotted to topics, preempt at least half of this inventory. As the features of man's original equipment whereby all the rest of that equipment is modified for use in a complex civilized world, they are of universal importance in education. They are the effective original forces in what has variously been called nature, training, learning by experience, or intelligence." From this general account of the laws of learning we shall turn to the specific task of finding out how they function in the stutterer's acquisition of speech.

(The data for the remainder of this discussion were collected from a psychological examination of 62 stutterers who were admitted to the speech department of the Vanderbilt Clinic during 1921. The Stanford Revision of the Binet-Simon Scale was used.) From an examination of the history of each of these patients it was very clear that the stutterer's difficulty began while he was forming the bonds between situations and responses which resulted in his building up habits of speech. When admitted to the clinic the median age of this group of 62 individuals was 12 years, 8 months. This does not mean, however, that they began to stutter at 12 years, 8 months, but only that the difficulty had developed to such a state that it was necessary for them to come for treatment. It was difficult to find out the exact time of the onset of the stuttering. Very few of the patients could designate a definite time, and upon questioning relatives of those who did designate a time for the onset, there seemed to be a reasonable doubt of its authenticity. By far the most common answer

received was, "I began to stutter when I was a little boy or girl. I don't know how old I was."

Kenyon says ("The Nature and Origin of Stammering"): "Certainly more than 95 per cent of the cases of stammering develop during the period when the young child is struggling to gain control of the complex speech function." Then later, in the same work, he says, "It is doubtful whether one in two, or even three, or four hundred cases is initiated after the eighth year of life." Kenyon, however, offers no definite data. From figures given by Scripture and Glogau on the onset of stuttering (*Journal of Nervous and Mental Disease*, Vol. 42, Jan., 1916) a median age of 5 years was found in 168 cases; the range was from "earliest childhood" to 15 years. No other investigators seem to have collected data on the age of an individual when stuttering begins. We can, however, from the data we have, be reasonably assured that the onset is quite early and comes on when the individual is forming the habits of speech.

With this point settled with some surety, another problem comes up: How does stuttering begin? What causes it? Many opinions have been on the etiology of stuttering, a few of which are briefly summarized:

Swift (*Journal of Abnormal Psychology*, 1915–1916) gives his idea of what causes stuttering in this manner: "Psychological analysis shows stuttering is an absent or weak visualization at the time of speech."

Fletcher offers a reason like this: "Stuttering, therefore, seems to be essentially a mental phenomenon in the sense that it is due to and dependent upon certain variations in mental state." (An Experimental Study of Stuttering. *American Journal of Psychology*, April, 1914.)

Bluemel ("Stammering and Cognate Defects of Speech"), outlines his theory this way: "A transient auditory amnesia, the stammerer being unable to recall the sound-image of the vowel that he wishes to enunciate."

Scripture ("Stuttering and Lisping," p. 5) writes: "The most frequent cause of stuttering is a nervous shock. The shock may be produced by practical jokes, severe falls and surgical operations."

Kenyon defends his theory this way: "The conception here presented finds the origin of the disorder in relatively light childish perversions of the psycho-physical processes required for the development of the complex speech function, and places great weight on the development of these light beginning perversions."

Hudson McKuen stated that heredity was the most important factor in the etiology of stuttering, and this notwithstanding the fact that stuttering is an acquired affection, in the sense that speech itself is acquired. (*The Therapeutic Gazette*, June, 1914.)

Gutzmann agrees that heredity is a very important factor, but he considered stuttering more or less a matter of temperament, claiming that most stutterers are excitable and hasty. ("Sprachheilkunde," Berlin, 1912, p. 373.)

Schrank believed that stuttering was mostly found among the mentally deficient children. ("Das Stotteruhel," Munich, 1877.)

Liebmann considered nervousness the real foundation for stuttering. ("Vorlesungen uber Sprachstœrungen," Berlin, 1899.)

Schmalz thought that a cramped condition of the vocal cords was a primary cause for stuttering. ("Uber Stammeln und Stottern.")

Wineken held that in all stutterers the will power is bounded by a language doubt. (Uber das Stottern, *Henle und Pfeufers Ztsch*, Vol. 31.)

Freud and Steckel believe that stuttering is the outward expression of an inward mental conflict. (Freud, "Zur Psychopathologie des Alltagslebens," 1904.) (Steckel, "Nervœse Angstzustænde und ihre Behandlung," Berlin and Wein, 1908.)

Froeschel thinks the nucleus of stuttering lies in the psychic condition of the patient who becomes conscious of the ataxically disturbed speech movements. ("Lehbuch der Sprachheilkunde," Leipzig and Wein, 1912.)

Nadoleczny held the exigencies of the first few school years as the momentous factors of stuttering. ("Die Sprache und Stimmstœrungen in Kindesalter," Leipzig, 1912.)

A discussion of these various theories on the etiology of stuttering will not be entered into, for the analysis and conclusion of the data which immediately follow will show plainly the point of view this work seems to warrant. These theories were cited rather to give a general and hasty review of some of the literature on the subject. This investigation is an attempt to determine something about the etiology of stuttering through objective measurement. Through the Stanford Revision of the Binet-Simon Scale an effort was made to answer these questions:

What is the mental level of the stutterer?

What is the nature of his mental development, *i.e.*, do his responses show an even or scattered development? And finally, has he a special word disability?

The median intelligence quotient (IQ) for this group of 62 individuals was 92 per cent. This might be termed a "low" average intelligence quotient, since 100 per cent is taken as the average for normal intelligence. The variation of IQ's within this group was 56 per cent to 130 per cent. To show the variation more plainly the following 8 groups are given:

Score 56– 70	8 individuals
Score 70– 75	8 individuals
Score 75– 85	8 individuals
Score 85– 95	13 individuals
Score 95–105	8 individuals
Score 105–110	6 individuals
Score 110–120	6 individuals
Score 120–130	5 individuals
Total, 8 groups	62 individuals

While it is true that this evidence warrants the conclusion that these stutterers tended on the whole, to be of low normal intelligence, the range of intelligence must not be overlooked. For instance, in this group there were 8 feeble-minded individuals, 8 borderline cases, 8 very low normal, 13 low normal, 8 normal, 6 above normal, 6 superior, and 5 very superior. It is obvious from the variation within this group, that it is unwise ever to form an opinion on the basis of a median measurement alone; it is the part of wisdom, however, to suspend judgment until the range and groupings within the range are known. The conclusion could not be drawn from these data that stutterers on the whole, have low normal intelligence, for as stated previously the cases were comparatively few and selected. Had the mental examination been made on a like number of cases in the diabetic or tuberculosis wards, perhaps the same median IQ would have been found. For it has been shown repeatedly by mental examination that on the whole individuals who seek help from charitable institutions tend to have low normal median intelligence quotients. Terman through objective measurements on different social classes proved this ("Measurement of Intelligence," p. 72). Therefore, before we could conclude that stutterers on the whole have low normal intelligence, we would have to have a greater number of cases, and the cases would have to be drawn from various social classes.

An attempt was made to answer the second question as to whether a stutterer has an even, or scattered mental development. When Binet constructed his scale it was on the assumption that the intelli-

gence grows in the same gradual way that the rest of the physical organism does. The regularity or evenness of physical development has been determined by an actual measurement of many children at different ages. By a comparison of these norms with the height or weight of a child it is possible to tell whether his physical development has been normal. If it has been, his height and weight will agree closely with the established norms.

Binet, his followers, and especially Terman who has standardized this scale for use in the United States, have found that intelligence does develop gradually and probably ceases at about the time the skeleton ceases to develop. When a child is found who measures much above the average mental level for his age, he is designated as superior in intelligence, just as a child superior to his norm for physical development is described as physically superior. While this even physical or mental development above one's norm is generally a superior manifestation, an uneven development (*i.e.*, markedly above one's norm in certain measurements and markedly below in others) is symptomatic. For example, suppose a child is 8 years old, and his height is that of a 12-year-old child and his weight that of a child 6 years old; or suppose again a child is 7 years old, has the weight of a 9-year-old child and the height of a 5-year-old child, these individuals would be matters of great concern and means would be taken to find out the cause of this uneven physical development.

As an illustration of uneven mental development, take the case of a boy 14 years old who recently came to this clinic for mental examination. He had reached the fifth grade by the age of 12; he failed on some of the tests at the third year level and had scattering successes up to the fourteenth year. This was a case of juvenile paresis and disease had caused a definite organic deterioration of the nervous tissue.

If no organic basis can be found for a scattering performance, the conclusion must be drawn that the disease is a functional one and the treatment falls within the scope of educational therapy.

An individual with an uneven mental development, and consequently a poorly integrated nervous mechanism, is liable to emotional "upsets;" he is unstable, and his responses to the situations of the environment are liable to be of a bizarre nature. As a result of this, in time, such an individual often develops character defects of an anti-social nature.

This evenness of mental development seemed an important thing to investigate in the case of the stutterer. For the emotional

"up-sets" and the unstable behavior in general of the stutterer are phenomena familiar to all who have observed him.

To determine the evenness of mental development in the 62 stutterers upon whose record this report is based, the difference between the basal age and the upper limit was found for each case and then the median of these two taken. The basal age is the point at which the subject passes all the tests, and the upper limit is the point where he fails in all of the tests. Due to the fact that some of these individuals were over 16 years old and others had superior intelligence, there were some successes at the 18-year level which is the last scale in the Stanford Revision; consequently, the spread for these individuals is not a correct one, since their upper limit was not determined. However, there were only 13 such cases and they have been counted as though their upper limit were 18 years. The median spread in years for the group from the point where all tests were passed to the place where none were passed, is 5 years. In other words, after finding a place where an individual could pass all the tests, it was necessary to continue through the scales for 5 additional years to find a point where he could pass no test at all. The groupings for this spread are as follows:

Number of Cases	Spread
3	2
7	3
15	4
7	5
9	6
12	7
8	8
1	9
Total, 62	

In giving this test to individuals of average intelligence or to those of inferior, or superior intelligence and an even development, it is generally necessary to proceed 3, or at the most 4, years above the basal age to find the upper limit of their achievement. Terman writing on this subject of scattering successes says:

"Why, it may be asked, should not a child who has 10-year intelligence answer correctly all the tests up to and including Group X, and fail on all the tests beyond? There are two reasons why such is almost never the case. In the first place, the intelligence of an individual is ordinarily not even. There are many different kinds of intelligence

and in some of these the subject is better endowed than in others. A second reason lies in the fact that no test can be purely and simply a test of native intelligence. Given a certain degree of intelligence, accidents of experience and training bring it about that this intelligence will work more successfully with some kinds of material than with others. For both of these reasons there results a scattering of successes and failures over three or four years."

Although an uneven intellectual development of 3 or 4 years above the basal age is a natural condition, a matter of 5, 6, 7, or more years above the basal age is sufficiently symptomatic to warrant an investigation. In the case of these 62 stutterers if we take a spread of 3 years above the basal age as a normal condition, a spread of 4 years as a borderline condition, and a spread of 5 years or more as indicating an abnormal uneven intellectual development, we find the following groupings:

10 with a normal uneven development
15 with an uneven development of 4 years
37 with an abnormal uneven development.

62 total

Here again is found an overlapping of results. This is always the case whenever any objective measurement is made of a comparatively random sampling of individuals. It is this constant overlapping of results which keeps an investigator from becoming dogmatic about his findings. But there is something more significant than maintaining the equilibrium of an investigator in this overlapping of objective measurements, and that is the continuity of any measurable trait, group of traits, or physical characteristic between any reasonably unselected group of individuals. No one group of individuals can be set apart in sharp contra-distinction to another; nature does not work that way.

In the case of stutterers while it is true that on the whole they show an uneven intellectual development, and that this condition is generally accompanied by emotional upsets, bizarre behavior, and later character defects, the fact that there has been a small overlapping of results must not be lost sight of. Successful therapy has always recognized the emotional disturbance of the stutterer.

This leaves the third question to be disposed of—as to whether the stutterer has a special word disability? The vocabulary test of the

Stanford scale begins at the eighth year. Obviously, then, the individuals under 8 years who had no superior intelligence could not be examined by the vocabulary test. Of these 50 there were individuals—ages 9, 10, and 11 years chronologically—who failed to pass the 8-year vocabulary test. It was thought best, however, for purposes of weighting to score them as having passed the 8-year test.

By the elimination of the very young stutterers, the median chronological age for this group was 13 years, 6 months. The median mental age for the group was 11 years, 9 months. Thus there is a difference between the chronological age and the mental age of 1 year, 7 months, while the difference between the chronological and the vocabulary age is 2 years, 7 months, a difference just twice as great. The difference between the mental age and the vocabulary age is 1 year. Clearly then, on the whole, the stutterer has a word disability, and of such a nature that he is unable to overcome it in proportion to his intelligence. An examination of the scores showed this grouping. There were 42 individuals whose vocabulary age was below both the chronological and mental age. Then there were 5 individuals whose vocabulary age was above the chronological age yet below the mental age. These were individuals of very superior intelligence, we may perhaps assume from this that the word disability was so severe that it could not be overcome in spite of the superior intelligence. Unfortunately, the history could not be gotten of 1 case, the only one whose mental age and vocabulary age were equal, yet both below the chronological age. The marked variation found in the vocabulary measurement, was the case of the following two stutterers: Their vocabulary age was above both the mental and chronological age. Both of the mental ages, however, were above the chronological. One case was of a young child who played constantly with an older brother who stuttered. The father brought him to the clinic and explained that he wanted to "break him of the habit before it got worse." The other case was a boy in high school and when asked how he happened to know so many words said, "I study the dictionary all the time, and when I read I write down all the words I don't know and then look them up and try to use them. I get stuck when I try to talk so I thought if I knew lots of words I could always think of one when I felt I was going to get baulked." This boy has superior intelligence; he has sensed his own difficulty and had set out undirected to correct it. The conclusion to the third question seems warranted that stutterers do have a real word disability. The writers hope through persistent

research to learn objectively something about the character of this word disability.

At the beginning of this work the thesis was put forward that speech is a learned reaction, and that the process of learning to talk follows the laws of learning. For this reason acquiring speech is a developmental process and begins early in life. By objective measurement it has been shown that these stutterers had a low normal intelligence quotient, that they had an uneven mental development, and a word disability.

The next problem to face is the one of etiology. If the laws of learning are recalled in this connection some additional light may be had. Man, to summarize the law, learns in accordance with his native capacity; he forms a bond between a situation and response; this bond must be exercised and accompanied with satisfaction if the habit be permanently formed. In the case of the 62 stutterers what will this mean? Since on the whole they had low normal intelligence, the bonds were formed more slowly and with greater difficulty than by an individual of normal or superior intelligence. These stutterers in forming speech habits were first handicapped by intelligence. In the next place, by an uneven intellectual development, this condition is generally accompanied by an unstable emotional and mental condition. The terms psychoneurotic, neurotic, psychopathic, hysteric, and constitutionally inferior, are descriptive of this kind of an intellectual development. These individuals generally lack perseverance and endurance; furthermore, they are liable to emotional upsets under trying and difficult circumstances. Finally, the stutterer has a word disability. The difficulty the stutterer encounters when he tries to learn to talk is now completely apparent. In the first place he forms the bonds involved in acquiring speech slowly and with difficulty. Moreover, in addition to this he has a word disability which makes it much more difficult to connect the proper response with the appropriate situation. It is plain to see that satisfaction could not follow the formation of a speech bond under the circumstances, and unless satisfaction follows the formation of a bond, it is not permanently formed. The picture of the stutterer is not completed, as tragic as it may now seem, for with this condition must be reckoned the final fact that he possesses an uneven intellectual development with its accompaniment of emotional disturbance. Obviously an individual with these limitations could not assiduously and with satisfaction apply himself to forming the bonds involved in the acquisi-

tion of speech. An individual does not know why he stutters and halts when he tries to say a word. This condition came on unconsciously and in early life when the speech bonds were being formed. A stutterer could no more explain his condition than a shell-shocked individual could his; in both cases the functioning had been below the level of consciousness.

This investigation, however, up to the present is not sufficient to justify a theory on the inception of stuttering. Before this could be given, further work must be done on the exact nature of the word disability, and tests must be given to get definite evidence of the bond forming difficulties. Yet if the results of these objective measurements as they stand can suggest more helpful methods for the treatment of stutterers, the purpose of the work will be fulfilled.

THE EFFECT OF THE STUDY OF LATIN ON THE ABILITY TO DEFINE WORDS[1]

(Concluded from the November Issue)

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It was thought that a study of French and German might improve the ability of the student to define the given list of words. In order to discover any important effect of these languages, the scores of the students in each of the three largest groups—those with no Latin, those with 2 years and those with 5 years of Latin—were each arranged on the basis of the years of French the subject had taken. They were also arranged again on the basis of the years of German the subject had taken. While this method of determining the effects of the study of these languages is not conclusive proof the results tend to show that they do not improve ability to define words appreciably more than the study of other subjects of the curriculum.

Most investigations have shown that the A.B. student or the student who has selected Latin is superior in native ability to the B.S. student who has studied no foreign language or at least no modern language. The present study presents no exception to this rule. The average intelligence score on Army Alpha, classified on the basis of the number of years spent in the study of Latin, is given in Table II.

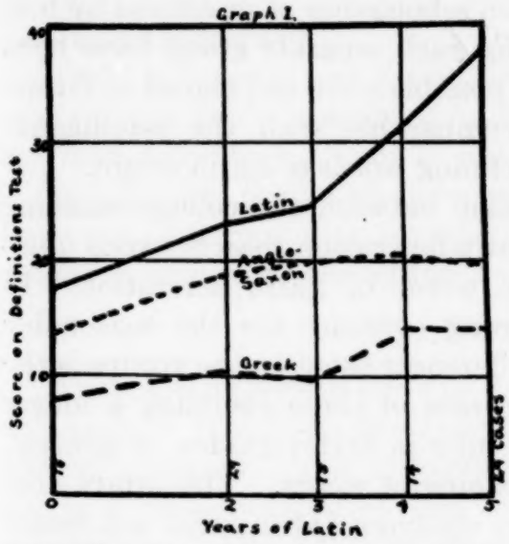
TABLE II.—YEARS OF LATIN

	0	2	3	4	5
Army Alpha Score.....	149	149	158.2	155.6	163.1
AD.....	20.4	14.4	11.3	22.7	17.2

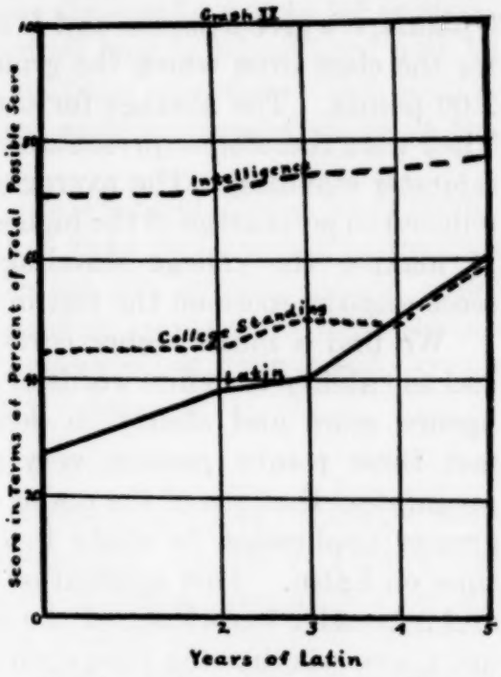
The average score for the class from which these groups were chosen was about 152. Therefore the groups chosen were representative of the intelligence of the class. Graph II provides a means of comparing the relative improvement in ability to define words of Latin origin with the intelligence score for each of the 5 groups studied. These graphs are constructed on the basis of the percentage of the possible total score on each test and hence since they are constructed on the basis of common units they are directly comparable. For example the

[1] By a mistake in the editorial office these pages were omitted from Dr. Gilliland's article in the November, 1922, issue.

no Latin group averaged 17.3 points credit out of a possible 60. That is, an average of 27.2 per cent correct responses. The same group averaged 149 points out of a possible 212 on Army Alpha, or 70.3 per cent of the total possible score. While the absolute standing of each group is not necessarily comparable—even though it might seem significant that none of the Latin scores are as high as the intelligence scores—it does give a means of relative comparison of the different groups. From a study of the graph it seems apparent that native



Showing the scores on the test in defining words of Latin, Anglo-Saxon and Greek origin.



Showing the relative standing of groups with different amounts of training in Latin in intelligence, college standing and score in defining words of Latin origin.

ability does not account for even the larger part of the improvement in ability to define words of Latin origin. It may be that a smaller percentage of difference in intelligence score is more significant than a similar difference in score in defining words. No data are available on either side of this question. It seems highly improbable that this difference is at least great enough to account for even the major part of the difference found between the two scores. What has been said of the words of Latin origin holds true to a lesser degree for words of Anglo-Saxon and Greek origin. Surely, the study of Latin has a real value in improving ability to define words.

Table III gives the average college standing for the first semester of the freshman year for each of the 5 groups.

TABLE III.—YEARS OF LATIN

	0	2	3	4	5
College standing.....	1.82	1.82	1.94	2.03	2.43
AD.....	.58	.65	.70	.75	.70

The highest possible college standing at Dartmouth College, where this study was made,—straight *A*'s—gives 4 points credit. *B*'s give 3 points, *C*'s give 2 points, and *D*'s give 1 point. The average standing for the class from which the groups were selected was approximately 2.00 points. The average for the 97 cases of the 5 groups was 1.98. They were therefore representative in scholarship as measured by first semester standing. The averages for each separate group have been reduced to percentage of the highest possible score and placed on Graph II making the college standing comparable with the intelligence score and the score on the test in defining words of Latin origin.

We find a much higher correlation between the college standing and the ability to define words of Latin derivation than between intelligence score and ability to define words of Latin derivation. In fact these results present very strong evidence for the reasonable assumption that one of the major differences between the groups is the greater application to study in the case of those spending a longer time on Latin. This application results in better grades, in general, and a broader knowledge of the meaning of words. This study does not prove whether the time spent in studying Latin might not better be spent in the study of the derivation and the meaning of words. Suffice it to say, too often the men who do not study Latin do not get such training in the study of words. The men spending 4 or 5 years in Latin may have more original ability in the subject. They have a slightly higher native intelligence. They also gain in ability to define words through a definite knowledge of the meaning of many words of Latin origin and through a better general understanding of how to analyze unfamiliar words. But above all the men spending several years in Latin are the men who take their college course most seriously and make good grades.

THE DETERMINATION OF ABILITY FOR LEARNING TYPEWRITING

W. W. TUTTLE

Principal of University High School, University of South Dakota

Vocational guidance has had a long history. In former times men attempted to control their objective environment or to determine their personal qualifications by magic, oracles, etc. Only within the last few years has there been a real scientific approach made to the subject. Even now men are tried out in the actual field in which they wish to work without any preliminary determinations concerning their ability. In many cases this method of selection ends in dissatisfaction on the part of all concerned.

There is scarcely any doubt that much time is wasted by students who train in fields in which they do not have the capacity to work to the best advantage. If it is possible for the psychologist to guide individuals into the vocation for which they are most talented or keep them out of the vocation for which they have but little talent, he can render to society service of inestimable value.

The Problem Stated

There are numerous more or less isolated problems connected with the work of vocational guidance and each one has its own particular line of approach. The problem which is being investigated by the writer is the possibility of determining in advance ability for learning typewriting. The problem presents itself in this form: Do those who become adepts in typewriting possess certain types of native ability and can this native ability be measured? On the other hand, do those who are not able to acquire proficiency in typewriting show, when tested, the absence of these types of native ability? In this study certain assumptions relative to these questions have been made and tested.

The following are, for the purpose of this study, considered to be the *essential native traits of an efficient typist:*

1. Quick motor action. (2) A keen sense of rhythm. (3) Ability to pay attention and be accurate. (4) A well developed memory span. (5) Ability to follow directions. (6) Ability to carry on the process of substitution.

Methods have already been devised for measuring these special traits. It was found necessary, however, to devise new ones and to vary those already in use, in order to get tests suitable for this experi-

ment. Group tests are used in all but one instance, but in this case the test is so easy to administer and check that it could be economically used in large classes. In all tests used the scoring is simple and can be done accurately.

A class of 20 students beginning the study of typewriting forms the basis of this experiment.

In order to determine the accuracy of this test for predicting typewriting ability, the results are compared with the typewriting grades made by the group at the end of the first semester.

The Tests Used

A description of the tests used, methods of administration and checking of results follows:

1. *Quick Motor Action.*—The object of this test is to determine one's ability to control the movements of the arms and hands. The test consists of tapping any key on the keyboard of a typewriter with any finger, as rapidly as possible. The number of the taps made by the subject was shown on the carriage scale. Each subject was given 5 trials, 5 seconds in duration, with each hand.

2. *A Keen Sense of Rhythm.*—This was measured by Seashore's test for sense of time. The test consists of 100 combinations of 3 clicks, marking off two intervals of time of different length. These combinations have been recorded upon a phonograph record so that they can be reproduced before the group.

3. *Attention and Accuracy Test.*—This test is divided into two parts. The first part consists of 9 horizontal lines of 61 figures each in which occur 100 combinations of two consecutive figures whose sum is nine. A copy of the test was given to each member of the group with instructions to underline all combinations of consecutive figures whose sum is nine. The time allowed was 5 minutes.

The second part of this test consists of 11 horizontal lines of 57 letters each, in which occur 100 combinations of x and n. A copy of the test was given to each member of the group with instructions to underline all adjacent combinations of x and n. The time allowed was 3 minutes.

4. *Memory Span Test.*—This test is made up of two parts. The first part consists of 6 horizontal lines with a total of 45 abstract words. The first line contains 5 words, each successive line increasing one word, making 10 words in line six. The words are read to the group, a line at a time, with an interval of 1 minute between readings. At the end of each 1-minute interval the group is instructed to write the lines of words as nearly as possible in the order in which they were read.

The second part consists of 6 horizontal lines of 45 concrete words. The lines are constructed the same as in Part I. The total time allowed for Part I was 5 minutes and for Part II, 3 minutes.

5. *Ability to Follow Directions.*—This test involves four elements, each setting forth very definitely certain acts which are to be performed. The time allowed for this test was 10 minutes.

6. *Ability to Carry on the Process of Substitution.*—The substitution test consists of 9 combinations, each of which is composed of one of the digits, and a symbol which represents it. For example, 1(, 2?, 3#, etc. Each student in the group is

given a key card containing the combinations of figures and symbols and another card containing only symbols. These symbols were arranged in 25 equal lines. The students were instructed to write opposite the symbols the corresponding figures, using the key as a guide. The time allowed was 5 minutes.

1. *Methods of Scoring.* (1) *Motor Action Test.*—The average number of taps made by the student in 5 seconds as indicated by carriage marker on the typewriter was used as the score. The highest score was 43.9 and the lowest was 28.4.

2. *Sense of Rhythm Test.*—In this test, one point was given for each correct response. The highest possible score is 100. The range in this test was from 54 to 86.

3. *Attention and Accuracy Test.*—One point was given for each combination correctly underlined. The highest possible score is 100. The range in this experiment was from 80 to 100 for the first part and 96 to 100 for the second.

4. *Memory Span Test.*—Two points were allowed for each word correctly reproduced in right order, and one point for each word correctly reproduced but in wrong order. The highest possible score is 95. The range in this experiment was from 36 to 71 for Part I and from 49 to 73 for Part II.

5. *Ability to Follow Directions.*—This test contains four elements. For the first, 10 points are given; for the second, 5; for the third, 5; and for the fourth 25. The time allowed was 10 minutes. The highest possible score is 45. The range in this experiment was 13 to 45.

6. *Ability to Carry on the Process of Substitution.*—Four points were allowed for each line correctly substituted. The highest possible score is 100. The range in this experiment was from 60 to 100.

The total score for all tests used is found by taking their average.

After the tests described above were given and the results checked, a typewriting test was administered. In order to determine whether the marks made by the students in the above mentioned tests were indicative of the results of the typewriting test, the two sets of marks were correlated. The following are the results:

	Coefficient of Correlation
1. Motor action and typewriting test	.54
2. Sense of rhythm and typewriting test	.10
3. Attention and accuracy test and typewriting test:	
Part I	.41
Part II	.68
4. Memory span and typewriting test:	
Part I.....negative	.30
Part II.....negative	.11
5. Ability to follow directions and typewriting test	.17
6. Substitution test and typewriting test	.52

The coefficients of correlation show that sense of rhythm and ability to follow directions are of but little significance in indicating ability to learn typewriting. Memory span is shown by the coefficient of correlation to have no direct relation to ability to learn type-

writing. The coefficients of correlation indicate, however, that motor control, ability to pay attention and to be accurate, and ability to

TABLE I

	Student number	Typewriting test grade	Student number	Total score of tests used in this study
Group I	1	69.4	1	84.4
	2	67.2	5	81.4
	3	66.9	9	81.2
	4	65.7	2	80.4
	5	65.0	4	80.0
Group II	6	64.6	10	79.3
	7	63.1	11	79.1
	8	62.9	16	78.8
	9	62.4	6	78.6
	10	61.8	13	77.8
	11	61.7	7	77.7
	12	61.4	8	77.6
	13	61.3	20	75.0
Group III	14	60.7	3	74.7
	15	60.4	18	74.4
	16	59.6	17	72.8
	17	59.0	15	71.6
	18	56.6	12	71.3
	19	55.6	14	64.6
	20	49.8	19	62.5

do substitution are indicative of capacity to become efficient in typewriting.

Since the tests show that the capacity to follow directions, memory span and sense of rhythm are of no consequence in the learning of typewriting, they are not considered further.

In order to determine the relation which exists between the tests for motor action, ability to pay attention and be accurate, ability to do substitution and the actual accomplishments in typewriting, the total score for these tests was correlated with the scores of the typewriting test. The coefficient of correlation between the scores for the typewriting test and the scores of the above mentioned tests was found to be 0.621.

Table I further shows the relation between the data which were correlated.

Conclusions

1. The data indicate that certain native abilities are closely related to capacity for learning typewriting. The students who receive high grades in the above mentioned tests also receive high grades in the typewriting test.

2. The grades made in the above mentioned tests and the typewriting test grades when compared according to rank were placed into three groups as indicated in Table I and Table II.

Table II

Typewriting Test	Test Used in This Study
Group I 65–70	Group I 80–85
Group II 61–65	Group II 75–80
Group III 49–61	Group III 60–75

In Group I, Table I, 5 students were placed by the typewriting test. Of these 5, 4 were found in Group I, of the above mentioned tests. The remaining one was found in Group II, of the above mentioned tests.

In Group II, Table I, 8 students were placed. Six out of this number were placed in Group II, of the above mentioned tests. Of the remainder of those placed in Group II, by the typewriting test, both falls in Group III of the above mentioned tests.

In Group III, Table I, 7 students are placed by the typewriting test. Of these 7, 5 are found in Group III of the above mentioned tests. Of those remaining in Group III of the typewriting test, 1 is found in Group I, and 1 in Group II, of the above mentioned tests.

3. The correlation between the scores as indicated by the typewriting test and the above mentioned tests is sufficiently high to indicate a strong relation between capacity to learn typewriting and the tendencies tested. This is also shown by Table II.

4. The results of the above mentioned tests when compared with the results of the typewriting test indicate that those making a mark of 80 or above in the above mentioned tests will become excellent typists; those making from 75 to 79 inclusive, will be but average typists, while those making below 75 will either be poor typists or fail entirely.

The rather limited scope of this study scarcely justifies final conclusions but the results indicate beyond any question that the possibilities along this line of study are great.

NOTES ON ARTICLES IN EDUCATIONAL PSYCHOLOGY IN CURRENT ISSUES OF OTHER MAGAZINES

REPORTED BY CECILE COLLOTON

Department of Educational Psychology, The Lincoln School of Teachers College

Intelligence Tests

Mental Yardsticks in Question. C. H. Mathes. Education, 1923, February, 342–351. Another question as to the reliability of the army tests. Discusses the need for recognizing other important qualities in addition to native intelligence.

The Psychological Test Versus the Teacher's Judgment. Charles H. Sampson. Educational Review, 1923, January, 16–17. Shows why the psychological examination is of more value than the teacher's judgment.

The Intelligence of Pupils Who Repeat. H. T. Eaton. School and Society, 1923, February 3, 139–140. A study of repeaters in special classes shows that only 51 per cent of the failures are determined by lack of mental ability.

Leadership in Relation to Intelligence. H. S. Bennett and B. R. Jones. The School Review, 1923, January, 125–128. A study of 29 pupils attending the Rochester Shop School seems to indicate that low intelligence bars a person from leadership. Intelligence was rated by Otis Group Intelligence Scale. Estimate of ability as leaders was the combined judgment of the instructors, the principal, and the athletic director. Six individual cases are described.

Intelligence of Teachers in Training—Effects with Intelligence Tests. Samuel Renshaw. Journal of Educational Research, 1923, January, 28–36. Summarizes the evidence on the intelligence of normal school students. Gives new data on 1199 students in the second largest of Michigan's normal schools tested with Form 6 of Army Alpha. Shows practice effect of test-taking.

Educational Tests

An Omnibus Achievement Test for the Upper Elementary Grades. C. W. Odell. The Elementary School Journal, 1923, January, 353–358. Discusses the results of a series of 15 true-false exercises in geography, history, elementary science, grammar, and certain phases of arithmetic based on the Chicago course of study.

The Influence of First-year Latin upon Range in English Vocabulary. Professor E. L. Thorndike. School and Society, 1923, January 20, 82–84. The Thorndike Test of Word Knowledge administered to all first-year pupils in 56 high schools, three times during the school year, shows a slight superiority of the Latin group. Four tables give detailed data.

The Influence of First-year Latin upon Ability to Read English. Professor E. L. Thorndike. School and Society, 1923, February 10, 165–168. A Comparison of

the scores of Latin and non-Latin groups on the Thorndike-McCall Reading Scale. Eight tables present the data. Data insufficient for reliable conclusions.

Knowledge of English among Normal School Students. Lawrence Augustus Averill. School and Society, 1923, January 13, 53–56. Results of a set of questions given to 453 young women just entering normal schools. Answers to each question are tabulated and reported in detail.

Does Knowledge of Formal Grammar Function? William Asker. School and Society, 1923. January 27, 109–111. Tests given to 295 freshmen in the University of Wisconsin show that the study of formal grammar has little influence on ability to judge the grammatical correctness of a sentence or ability in English composition.

Study of Depth and Rate of Comprehension in Reading by Means of a Practice Experiment. Arthur I. Gates. Journal of Educational Research, 1923, January, 37–48. Describes an experiment in which the Burgess test was used 5 days, 5 minutes per day and the Thorndike-McCall for 30 minutes per day for 7 consecutive school days. Thorndike-McCall is more reliable than the Burgess. Various forms are not of equal difficulty.

Miscellaneous

The Superior Child in Our Schools. Clara Harrison Town. Educational Review, 1923, January, 17–21. Discussion of the problems involved in choosing superior children, planning a program for them, and carrying out this program.

The Standardization of Tests and Scales. Peter Sandiford. Journal of Educational Research, 1923, January, 14–26. A discussion of the problems involved in the standardization of tests shows need of restandardization of American tests for Canadian schools. Eight tables give detailed data.

Principles Underlying Grading. Florence Y. Humphries. The English Journal, 1923, January, 33–38. Argues for a standardization of marks by (1) determining a minimum requirement and (2) agreeing on a *definite* interpretation of each mark above the minimum.

Army Experiments in Examinations. Elbridge Colby. Educational Review, 1923, January, 7–9. Describes types of special examinations used at the Infantry School at Fort Benning, Georgia.

The Will to Learn. William F. Book and Lee Norvell. Pedagogical Seminary 1922, December, 305–362. "An Experimental Study of Incentives in Learning."

NEW PUBLICATIONS IN EDUCATIONAL PSYCHOLOGY AND RELATED FIELDS OF EDUCATION

CONDUCTED BY LAURA ZIRBES[1]

1. *Is the Intelligence of the American Nation on the Decline?*—The intelligence examination of over a million men in the army during the recent war was a feat of which American psychologists may well be proud. The significance of the results of the tests is great. Many interpretations, scientific and popular, have been essayed. The final verdict as to their real meaning has not yet been made. But here comes a psychologist who has studied one aspect of the intelligence scores thoroughly and carefully, and who draws far-reaching and important conclusions from this study.[2] In brief, he concludes that the intelligence of the people of this country has been declining for the past 50 years or more. This is due to the two factors of immigration and race mixture. The Nordic stock is more intelligent than the Alpine or Mediterranean, and our immigration has progressively increased the proportion of the two latter races. The race mixture now going on tends to lower the average of the whole nation, not alone by mixture of these European stocks but also by a still more insidious mixture with the negro race.

This thesis is carefully worked up to by a logical and careful analysis of the results of the army tests. The native draft is compared with the foreign-born. The foreign-born men are further divided into the various countries of origin and the differences between the average scores of these groups presented. Most important for the author's thesis is the negative correlation between intelligence and length of residence in this country. This decrease in score is not due to the handicap of language as one might at first be inclined to conclude. It would seem to be a real decline in intelligence. The nationality groups that fall lowest are Russia, Italy and Poland. A large percentage of recent immigration has been from these countries.

[1] Unsigned reviews which appear in this department are prepared by Laura Zirbes.

[2] Brigham, C. C.: "A Study of American Intelligence." Princeton University Press, Princeton, 1923, p. 210.

The most novel part of the study comes in the author's attempt to estimate the relative proportions of Nordic, Alpine and Mediterranean blood in the various countries of Europe, and then to calculate the proportions of each of these three racial groups among the immigrants. How accurate these estimates are it is impossible for the reader to judge. The author is frank to acknowledge the difficulties involved and he tells us that if we do not like his figures, we may make our own estimates and re-calculate the figures for the immigrants. But even suppose we do accept the author's estimates, we may yet object to his implications in Section X, where he jumps from the calculated intelligence of the Nordic, Alpine and Mediterranean races as represented in this country to the conclusion that these differences in intelligence also hold for the three races in Europe. Hence the superiority of the Nordic stock. But this assumes that immigration has been absolutely non-selective, that the representatives of the three racial groups in this country are random samplings of the racial groups in Europe, and this is certainly open to question. Nevertheless, this assumption does not vitiate the main argument of the study.

Whether we are prepared to agree with all of Dr. Brigham's statements or not, we shall certainly be in hearty agreement with him when he demands a more selective policy for future immigration and a more vigorous method of dealing with the defective strains already in this country. Dr. Brigham has presented clearly and logically an immensely interesting topic. His book should be read not only by professional psychologists, sociologists and educators, but by all thoughtful men and women who have the future of this country at heart.

R. P.

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2. *A Psychological Presentation of a Course in Psychology.*[1]—Surely we should expect to find psychological principles applied in the organization of a course in psychology and in a textbook presenting materials for such a course, if indeed such principles are applied in any field. In the preface of this book is a list of generally accepted principles fundamental to good teaching. In the following pages are 23 lessons, not chapters, embodying in a surprising manner those very principles. We quote from the preface after noting that the organization of the book is true to the statements there set forth:

[1] Strong, E. K., Jr.: "Brief Introductory Psychology for Teachers." Baltimore, Warwick and York, Inc., 1922, pp. xi + 241.

"Instead of beginning with the most uninteresting phases of psychology and those most unknown to students, the course takes up concrete experiences of everyday life, relates them to the problems of learning, individual differences, and influencing others, and so develops these topics. Each general principle is discovered by the student out of his own experience in solving specially organized problems. Only after he has done his best is he expected to refer to the text and by then the text is no longer basic but only supplementary, clearing up misunderstandings and broadening the whole viewpoint. . . . The student is immediately introduced to problems of behavior taken as a whole and only after he is fairly familiar with psychological procedure, terminology and point of view, is he given his psychological background. . . . Each topic is handled as follows: (1) The student performs an experiment illustrating the principle to be emphasized, (2) he solves the problem as best he can and hands in his report, (3) he has the benefit of a class discussion upon the subject at the next class-hour, (4) he reads over what the author has to say on the subject, (5) he receives back his own corrected paper on the subject, (6) he reviews the subject later on. . . . The test is printed as a book and in the form of 23 booklets. . . . This is important as the odd numbered lessons contain the answers to most of the problems. Where students read ahead they lose the training resulting from working problems out for themselves."

Turning to the lessons, one is at first disappointed to see that the first lesson begins with the caption "What is Psychology?" How does that carry out the promise of the preface? But preceding the first definition is a long quotation from Booth Tarkington's "Penrod," followed by 7 questions on the "behavior" of Penrod, Mabel and Sam, and then by the question "Can this be psychology?" Another interesting paragraph and we come to the following: "The following definition is just to aid the reader in orienting himself. Only toward the end of the course will he be prepared to grasp its full meaning. Psychology may best be defined as the science of behavior. There is the definition. The matters dealt with in the next 10 sections will give some of the various fields included in its bounds." And then we find 10 carefully selected incidents from real life, each followed by a series of questions giving the beginner a notion of the scope of the field and the further content of the course.

More conclusive than any *a priori* judgment would be the results of a carefully controlled experiment in which the effectiveness, organization and content of this and other "Introductory Courses in Psychology" were compared.

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3. *On the Theory of Educational Measurement.*—The appearance of this well pruned volume of 360 pages on the theory of educational

measurements[1] is one indication that the testing movement is losing the exhilaration of an uncontrolled amateur sport and is taking on the sobriety and hard-headed sanity of actual scientific work. Serious students of measurement, research workers, and other school people interested in the subject will appreciate what Professor Monroe has done here to hasten the change. The theory presented in this book is, if one may use the expression, of a very practical sort. It has to do mainly with such things as the construction of tests and scales, the types of pupil performances susceptible of measurement, the meanings of scores and norms, the validation of testing instruments, and the technique of the application. There is not much of the material in the chapters devoted to these topics that is strictly new, but it has been collected from many scattered and inconvenient sources and subjected to new organization, classification, definition, and critical interpretation. The result is a very intelligible treatment of questions that test makers and test users desire very much to understand. Incidentally a good deal of the fiction with which early enthusiasm invested measurement is disposed of.

The most elaborate discussion of any topic is that given to The Critical Study of a Test. A long outline states the points on which a test is to be judged. The main divisions are headed as follows: Facts Title; Nature of Pupils' Performances; Description of Pupils' Performances; Functions of the Test; Validity of the Test; Validity of Significance; Practical Considerations. The subsequent discussion is admirable from the standpoint of the academic experimentalist but a little discouraging to a teacher or supervisor who might consult it for a quick way to size up a test. A rather more practical than theoretical chapter on the improvement of school examinations presents the case for such new types as the true-false, the "yes" and "no," the recognition, and the completion exercises. The suggestions here should have an appeal for any teacher who believes in examinations at all. Two concluding chapters on statistical methods remind us again of defects in our early mathematical training and are consequently needed and helpful.

All chapters are provided with good lists of questions and topics for investigation as well as extensive bibliographical references. The make-up of the book is such as to make it a decidedly convenient

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[1] Monroe, Walter Scott: "An Introduction to the Theory of Educational Measurement." New York, Houghton Mifflin Co., 1923, pp. 360.

text for advanced pupils in education and somewhat of a manual of reference for practical workers in measurement.

M. H. WILLING.

Springfield, Illinois.

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4. *A Survey of Methods of Judging Human Traits.*—This book,[1] written primarily for the general reader, is a non-technical presentation of the present status of methods used in the appraisal of human character. Acknowledging the incompleteness and lack of finality which characterizes the present accomplishment, the author, nevertheless, considers it desirable to bring together into one volume, descriptions and accounts of the various lines of development which may serve as starting points for further inquiry and at the same time, to indicate the practical implications and applications of such measurements. The inadequacies and limitations of each method are set forth in turn. The text is accompanied by numerous tables, charts and illustrations. The book could be used with profit as an introductory text in a course on mental measurements. Appendix B, following the classified bibliography, contains 16 exercises or experiments for use in such a course.

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5. *The Case Method in School Management.*—If one turns to this book[2] to find another systematic and logical treatment of psychology, philosophy, and the principles of class management and school administration, he will be disappointed. If he expects to find any proposed solutions of teacher problems that are strikingly new, he will scarcely find them here. Its contribution—and that it is a real contribution should be asserted in unmistakable terms—is in its concreteness and in its development of principles of school management through the study of concrete school situations.

Two hundred and forty-one practical problems are presented in 16 chapters dealing with discipline, subject matter and method, individual differences, economy of time, health, relationship of teachers with each other, with supervisors and administrators, and with parents, and finally, with professional growth. The effectiveness of the plan for

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[1] Hollingworth, H. L.: "Judging Human Character." New York, D. Appleton and Company, 1922, pp. xiii + 268.

[2] Stark, W. E.: "Every Teacher's Problems." American Book Company, New York, 1922, pp. 368.

presentation of school problems is illustrated by the three problems discussed in a typical chapter. In Chapter IV, dealing with children's attitudes, self-direction and ideals, 3 situations are described as follows:

Problem 52 (p. 57). A boy defaces the school building by writing on the plaster walls. On entering the school, the teacher observes a group of children examining the scrawl. A boy remarks jokingly, "That looks like your writing, Tom." Tom replies: "Sure, it's my writing."

The teacher asks him if he really did it, and he says again, "Sure."

Problem 53 (p. 60).

JUNIOR HIGH SCHOOL

OFFICE OF THE PRINCIPAL

NOTICE TO TEACHERS

The subject of the next teachers' meeting will be

CONDUCT DURING INTERMISSION PERIODS

Mr. Evans will report on his day of observation in the H..... School, where pupils pass from one recitation room to another without supervision and without forming in files. He recommends that we adopt the same plan. Come prepared to discuss this proposal.

EDW. B. JACKSON,
Principal.

Problem 54 (p. 67). In marking a set of examination papers, a teacher notices a peculiar mistake and, a little later, she finds exactly the same error in another paper. She therefore compares the two papers and finds that parts of them are almost identical. The similarity is too perfect to be accidental and, since the abler student sits in front of the other, she is forced to conclude that both have shared in the deception.

An account is given of the active process of solution of these problems in which teachers, principals, superintendents and parents take part. Into this group of searchers for solutions the reader is invited, and the reviewer found himself accepting the invitation pretty regularly. Then follow a dozen or so other practical "problems for the reader to solve," and the reviewer is inclined to believe that the readers will pay more serious attention to them than it is usual for problems stated at chapter endings to receive.

Throughout the book Mr. Stark has presented common sense solutions which show keen insight into the practical difficulties that arise in every active school system. Such insight comes from a successful and active experience in practical school situations, from a scholarly interest in educational psychology and philosophy, but most

important, from a sympathetic understanding of how a youngster reacts when he feels unjustly treated, and how the young teacher feels who senses the fact that she is not doing well. It is a progressive and safe guide for practical school people who feel the wisdom of thinking through the problems they are called upon to solve.

PHILIP W. L. COX.

Lincoln School of Teachers College.

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6. *Scientific Technique Applied to Textbook Selection.*—This little volume[1] furnishes two examples of scientific procedure in the evaluation of textbooks. Following an introduction by Ernest Horn, the authors have set forth numerous criteria or principles of textbook selection. They stress the superiority of objective evidence over subjective opinion but they admit the practical impossibility of securing objective data in every case and suggest numerous safeguards which increase the dependability of judgments when they must be used.

The application of the criterion of interest is demonstrated in Knight's study of High School Literature Texts. The purpose of the study is so laudable and the technique so painstaking that we are inclined to reserve criticism. But we must ask, do not the various criteria impinge upon each other? Is not the application of a single criterion therefore a mere first step which leads nowhere if not followed by as careful an investigation of other important considerations? Furthermore what are the factors of experience with a literary text which are components of the good "after-taste" designated as interest in this study? The possible effects of various methods of teaching are merely mentioned. Uhl's study would lead us to believe that interest is highly dependent on a number of more or less measurable factors. Does statistical reliability of the results in one phase of a problem excuse us from the consideration and solution of all other phases?

The following quotation makes us wonder whether one must necessarily forswear aesthetic realities in order to be scientific. "After all, literary merit or any of its synonyms contains but little useful truth. It is similar to such phrases as the Well-rounded Life, Education for Complete Living, True Culture, Good Citizenship and the like. . . . These are verbal fog screens concealing chiefly differences of opinions."

[1] Franzen, R. H., and Knight, F. B.: "Textbook Selection." Baltimore, Warwick and York, Inc., 1922, pp. 94.

In spite of the lack of agreement as to literary merit in the data, there is room for other conclusions.

Franzen's chapter setting forth the application of the criterion of comprehension to geography texts does not pretend to be more than an illustration of the technique. It does not eventuate in the recommendation of a specific text or group of texts. It does point out the necessity for considering more than one criterion. It does apply a single criterion in a thoroughgoing fashion and analyzes the results in a scientific and practical manner. The illustrative value of the study is not impaired by the absence of didactic recommendations. We turn back to Chapter I and wonder who will finish the good work and illustrate the application of all the criteria there listed to a single problem.

Briefer Mention

7. *What is the "New Psychology?*[1]"—In this case it is analytical psychology. The term has been avoided because of the limits to its application laid down by the Freudian School, with which the writer is not in entire agreement. It is a stimulating account of some elementary facts, usually treated under the head of psychoanalysis, and is designed to help the teacher in the solutions of personal and professional problems.

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8. *Psychological Guidance in the Problems of Child Nurture.*—This book[2] was written to interpret the discoveries of modern child study to parents. In order that all the agencies that contribute to the child's development and education may do their full part, it is essential that the efforts of home and school be coordinated. Teachers and parents will welcome a clear, straightforward presentation of the fundamental factors in the successful upbringing of children. Planned for use in Parent Training Classes and similar groups, the numerous illustrative incidents, the problems listed as "Suggestions for Further Study," the practical suggestions, the correlated references, and comprehensive bibliography should make interesting material for study groups.

[1] Miller, H. Crichton, M.D.: "The New Psychology and the Teacher." New York, Thomas Selzer, 1922, pp. 225.

[2] Baker, Edna Dean: "Parenthood and Child Nurture." New York, The Macmillan Company, 1922, pp. xvii + 178.

9. *Applied Psychology in Arithmetic Practice Exercises.*—This pamphlet[1] should not only be used as intended by its authors. Students of Educational Psychology and practice teachers should be referred to it as illustrating well motivated drill, systematic practice, the pressure of a time limit, economical scoring and learning technique, practical provision for individual differences, definable objectives, supervised study, and last but not least, experimentally evaluated curriculum material.

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10. *A Helpful Book on Sex Education.*—Those who have followed the work of the American Social Hygiene Association will wish to read the revised edition of Dr. Galloway's book[2] on problems of sex. The book is more than its title implies. It is not a mere descriptive text, as a few selected chapter heads will prove: Some Principles Which Must Guide Sex Instruction; The Mental, Social and Moral Bearing of Sex; Time and Manner of Instruction; Graded Problems and Projects in Sex Education. We know of no other book in this field so rich in constructive suggestions.

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[1] Schorling, Raleigh and Clark, John R.: "Practice Exercises for Accuracy and Speed in the Fundamentals of Arithmetic." Preliminary Edition, Yonkers, N. Y., The Gazette Press, 1923, pp. 32.

[2] Galloway, T. W., Ph.D.: "Biology of Sex." New York, Heath, 1922, pp. xxiii – 149.